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HYPOTHERMIA IN CARDIAC SURGERY.

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THE desirability of a bloodless field for the surgical correction of congenital and acquired cardiac defects has been responsible for the introduction of many new techniques. These have aimed either at protecting vital tissues during periods of hypoxia by means of induced hypothermia, or at obviating the hazard of hypoxia entirely with an extracorporeal circulation.

The final status of induced hypothermia as an aid to cardiac surgery has not been settled. "Classically", the reduction of body temperature to the 30°-32° C. range permits an eight or nine minute period of complete circulatory arrest. This short time proves sufficient to repair secundum atrial septal defects. It is more than ample to relieve stenosis of the pulmonary or aortic valve, unless elaborate sculpturing of the cusps is intended. Even today, the great hazard of hypothermia is still ventricular fibrillation. The complete ætiology of this serious arrhythmia remains unknown and its prophylaxis imperfect.

In the 30°-32° C. range, longer periods of circulatory arrest, essential to deal with more complicated cardiac defects, result in severe, possibly permanent, neural damage. Several techniques have been evolved to overcome this limitation. Differential brain cooling via a carotid artery has been used to protect neural tissue without simultaneous increase in the incidence of hypothermic ventricular fibrillation (*Sugie et alii, 1956*). Although it is possible by this means to reduce the brain temperature to 20° C. without cooling the heart below 30° C., differential brain cooling has not been widely adopted. The latter cannot be said of the extracorporeal circulation which has been developed extensively all over the world. In some centres, it has replaced induced hypothermia almost completely. With the aid of the extracorporeal circulation, a relatively bloodless heart is ensured for periods up to 60 minutes, during which time the vital tissues are perfused by the machine. The technique is complex and raises certain problems, such as the ætiology and prevention of pulmonary complications, and the safety of complementary measures such as induced cardiac arrest or intermittent aortic occlusion. Thus it would not appear justified to employ an extracorporeal circulation in short operations handled with great ease and low mortality by hypothermia alone.

Although in some centres the popularity of hypothermia has waned, recently it has been involved in two developments of the extracorporeal circulation. Sealy *et alii* (1958) have been using moderate hypothermia (*30°-32° C.*) to increase the safety of low flow total body perfusion. In three cases, Drew and Anderson (1959) employed deep hypothermia (to 10° C.) to protect the brain during periods of complete circulatory arrest, as long as 45

minutes. An extracorporeal circuit was required for bloodstream cooling and to assist the circulation, which fails as hypothermia deepens. Ventricular fibrillation does not occur regularly despite the low temperatures reached (Kenyon *et alii*, 1959).

As an aid to cardiac surgery at the Royal Prince Alfred Hospital, Sydney, induced hypothermia has been employed for the repair of secundum type atrial defects and for the relief of stenosis of the aortic and pulmonary valves. For the two last-mentioned operations, hypothermia has been supplanted by the normothermic heparin-fluothane technique introduced in Melbourne last year. The purpose of this paper is to relate our experience with the management of patients for direct-vision repair of secundum atrial defects with hypothermia and total venous inflow occlusion.

Pre-operative Preparation.

Although the standard preparation for a thoracotomy is required for these patients, certain additional measures must be considered.

Digitalization.

This is a routine measure before operation, whether signs of heart failure are present or not. The aims are to control ventricular activity should auricular fibrillation arise as the body temperature falls, and to anticipate the possibility of heart failure in the early post-operative days. The risk of precipitating ventricular fibrillation in a hypothermic heart by digitalization exists only in the presence of digitalis overdosage or of hypokalæmia.

Estimation of Cold Agglutinins.

The presence of cold agglutinings in the patient's serum contraindicates the use of ice to produce hypothermia, even if these antibodies are unaccompanied by hæmolysins, and no matter what their titre or thermal range. The risks of low body temperatures in these patients are gangrene of the peripheral parts of the body and acute hæmolytic episodes with renal damage. The possibility that the agglutinins may have followed a recent viral infection should be remembered, for under these circumstances their presence may be temporary; in this case, periodic estimations should be made to detect any fall in titre which may precede the final disappearance of the cold antibodies from the serum.

Detection of Hæmolytic Staphylococci.

Each patient as a routine measure has a nasal swab examined, and a careful examination of the skin is made for lesions of likely staphylococcal ætiology. If the hæmolytic *Staphylococcus pyogenes*, phage 47, is cultured from the nose, the operation is postponed till vigorous local therapy with "Neotracin" ointment and "Hibitane" drops eliminates these organisms from the nose. These patients are best discharged home, so that contact with the staphylococcus becomes less likely. Other strains of *Staph. pyogenes* in the hospital are sensitive to most of the newer antibiotics. If these more sensitive strains grow from the nasal swab, plans for operation continue, local therapy as above is employed, and the systemic administration of erythromycin with "Chloromycetin" is started immediately. In all cases antibiotic therapy with these two agents is begun 12 hours before operation. The combination of erythromycin and "Chloromycetin" is designed with a knowledge of the present sensitivities of our micro-organisms, and with the aim of delaying the emergence of resistant strains.

If examination of the skin reveals lesions of likely staphylococcal ætiology, the operation is postponed. The systemic use of antibiotics is avoided, but local therapy with "Neotracin" ointment and regular antiseptic baths is employed. At times successive crops of pyogenic skin lesions have necessitated the postponement of surgery for many months.

Liaison with the Red Cross Blood Bank.

Both the quality and quantity of blood required for these operations make it imperative that a close understanding exists between the hospital and the Blood Bank. Three litres of the usual citrated blood are reserved for replacement purposes. Half a litre of freshly collected heparinized blood is necessary to perfuse the coronary vessels during the actual repair of the defect. All the bottles of blood are placed in a water bath on the morning of operation, so that they may be warmed to 30°-32° C. before use. This avoids the possibilities both of excessive general hypothermia due to rapid transfusion of citrated blood and of excessive local cardiac hypothermia due to perfusion of cold heparinized blood, each of which predisposes to ventricular fibrillation.

Facilities for Rapid Blood Replacement.

As a routine measure, a short, large-bore gold cannula is inserted into a forearm vein before cooling commences. This proves highly efficient for rapid blood replacement. The cut-down is performed under general or local anæsthesia, according to the cooperation of the patient. An essential adjunct to accurate replacement is the measurement of the progressive blood loss by means of a graduated sucker bottle and by weighing of sponges and swabs.

Management during Operation.

Anæsthesia.

Premedication.—A narcotic and an anticholinergic are administered subcutaneously one hour before induction of anæsthesia. For children, morphine (0·3 mg. per kilogram) or pethidine (1·5 mg. per kilogram) and atropine (0·01 mg. per kilogram) are employed up to standard adult doses.

Induction.—A moderately deep sleep is produced with 2·5% or 5% "Pentothal Sodium" solution. If veins present a problem in small children, 5% "Pentothal Sodium" solution given intramuscularly (20 mg. per kilogram) provides smooth anæsthesia in about five minutes. No local complications have appeared after these intramuscular injections. Intravenous or intramuscular injection of succinylcholine (1 mg. per kilogram or 4 mg. per kilogram respectively) provides muscle relaxation for endotracheal intubation and for the insertion of a thermistor into the lower end of the œsophagus. Occasionally in small children, induction of anæsthesia and intubation are performed with cyclopropane alone.

Maintenance.—The anæsthetic system is closed with to-and-fro carbon dioxide absorption. The soda lime is replenished every 90 minutes in operations on adults, every 45 minutes in operations on children. To maintain an arterial pH in the vicinity of 7·6, ventilation is controlled throughout, manually in the cooling and warming phases, mechanically with a Blease "Pulmoflator" in the operative phase. Cyclopropane (25% in oxygen) is administered till the œsophageal temperature falls to 33·5° C., and its administration is recommenced during warming until the œsophageal temperature rises to 35° C. During the operative phase, nitrous oxide and oxygen (2:1) are used with a total flow of three to five litres per minute. Tubocurarine (0·5 mg. per kilogram) provides the relaxation essential for efficient ventilation and rapid cooling. If residual muscular paralysis exists at the cessation of the warming phase, standard doses of atropine and "Prostigmin" are given.

During Circulatory Arrest.—As the hypoxia intensifies in this phase, the patient begins to take deep apneustic breaths. The excessive diaphragmatic contractions jerk the heart downwards. The surgical repair is impeded and the asphyxia accentuated. To prevent these breaths, a large dose of succinylcholine (10 mg. per kilogram) is injected intravenously two minutes before caval occlusion; at the same time the nitrous oxide-oxygen mixture is replaced by air, so that during the actual repair of the atrial defect it is possible to hold the lungs moderately inflated with air.

Cooling and Rewarming.

Before the cooling phase commences, provision is made to monitor cardiac function. An electrocardiograph continually records the electrical activity of the heart; sub-

cutaneous electrodes provide a very reliable contact with the patient without undue pressure on or constriction of the limbs. During all phases of the procedure the blood pressure is recorded to palpation with a sphygmomanometer. With practice, a radial artery may be palpated with little difficulty despite the peripheral vaso-constriction that occurs on cooling. After the chest has been opened, the right internal mammary artery is cannulated for direct intraarterial pressure recording. A comparison of these latter records with those taken to palpation has confirmed the reliability of the simpler method.

The temperature is recorded by thermistors in the lower part of the œsophagus and in the naso-pharynx. More reliance is placed on the œsophageal record, for it reflects very accurately the central cardiac temperature.

After the surgical staff has scrubbed and gowned, the naked patient is wrapped in a linen drape and placed in an inflated dinghy. Cold water and ice are added till about 70% to 80% of the body surface is immersed. Care is taken to exclude the head and neck, the feet and the upper limb employed for transfusion and blood pressure recording. By this means, a large area of skin is exposed to water at 2° to 4° C. Rapid cooling is aided by continual manual agitation of the water. No matter what the initial temperature, immersion continues till the œsophageal reading falls to 33·5° C. when the patient is removed from the dinghy, placed on the operation table and thoroughly dried. The operation starts, and by the time the surgeon is ready for caval occlusion, the after-drop is complete, the œsophageal temperature levelling out in the desired 30°-32° C. range. A fall of about 0·25° C. may be expected from the thoracotomy alone.

At the completion of the operation, the wound is sprayed with a waterproof plastic dressing. Again the patient is placed in the dinghy, to be rewarmed actively in water at 45° C. As the œsophageal reading rises to 35° C., the patient is removed from the water, placed in the bed and thoroughly dried. The electrocardiograph leads and thermistors are removed, and by the time the patient has reached the ward, the after-rise is complete and the body temperature normal.

Coronary Perfusion.

During caval occlusion the heart continues to beat actively. To supply its metabolic needs and thus prevent acidosis during this period, the coronary vessels are perfused proximal to the cross-clamped ascending aorta.

The bottle of fresh heparinized blood is oxygenated as soon as it is delivered to the operating theatre. This is accomplished by connecting it to an oxygen cylinder via a short, sterile, gauge 16 venesection needle and a length of sterile plastic tubing. The compressed oxygen is allowed to fill the air space above the blood for six seconds at a flow of 6 litres per minute. The needle is removed, and the bottle is inverted repeatedly for about 10 minutes until the blood develops an obvious bright arterial hue. To allow the escape of any excess oxygen, a short needle is reinserted into the bottle. An average oxygen saturation of 100% is obtained with ease and without the necessity of bubbling oxygen through the blood. Once the blood is oxygenated, the bottle is placed in the water bath at 32° C.

The heparinized blood is delivered into the aorta, during repair of the deficit, via an autoclaved plastic blood-giving set and a short gauge 18 needle. The blood flow through this needle is regulated by gravity to 80 ml. per minute before it is inserted and sutured into the aorta. To prevent a flow of the patient's coagulable blood into the needle before actual perfusion, the giving set should be clamped tightly close to the needle and the insertion of the latter postponed till just before caval occlusion.

Results.

The management outlined above has been used in 50 cases in which the diagnosis was secundum type atrial septal defects. The only major variation has been in the first seven cases with regard to the coronary perfusion (Table I). In the first three, this technique was not yet in use. In the next four, "arterialized" venous blood was used instead of artificially oxygenated blood.

In four cases, during exploration of the right atrium before caval occlusion, the defect was discovered to be of the primum type or complicated by anomalous veins. As adequate repair within nine minutes was impossible with safety, these patients subsequently underwent operations with the aid of the extracorporeal circulation.

Table I shows the final position.

TABLE I.

Fifty Cases of Suspected Atrial Septal Defect, Secundum Type.

Operation.[1]	Number of Subjects.	Coronary Perfusion. (1 Ml. per Kilogram per Minute.)
Exploration of atrium with hypothermia	4	None.
Repair with hypothermia and caval occlusion	3	None.
Repair with hypothermia and caval occlusion	43	4 Arterialized venous blood. 39 Oxygenated blood.

Age Distribution.

Although the youngest patient was aged four years and the oldest 53 years, the ages have been fairly evenly distributed, as is shown in Figure I.

Hypothermia.

The œsophageal temperature before cooling was between 36° and 37° C.

The time taken to fall to the desired 30°-32° C. range was related to the body weight, and of this time 50% was occupied by actual immersion in ice and 50% in the completion of the after-drop subsequent to removal of the patient from the dinghy. The average temperature at the time of caval occlusion was 30·5° C., with a range from

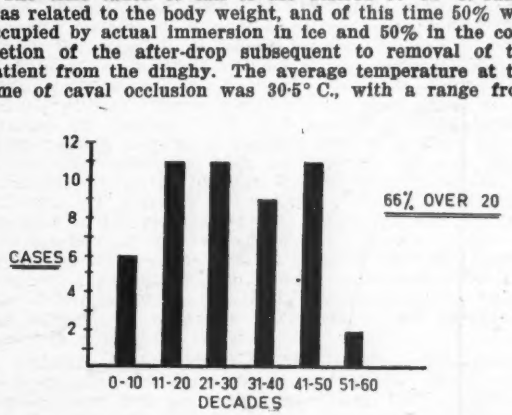

FIGURE I.

Age distribution, 50 cases.

24°-32° C. The dangerously low reading of 24° C. occurred in the first case of the series. Since that time, the œsophageal temperature has fallen below 30° C. on four occasions, and the lowest reading has been 29·5° C. In two cases, each of the patients weighing over 65 kg., it proved necessary to apply icebags to the axillæ and supraclavicular fossæ to move the temperature down into the desired range. This was accomplished with ease and without interrupting the surgeon. In rewarming, the time required for immersion in water at 45° C., till the œsophageal reading rose to 35° C., was related to the body weight. The rates of temperature change are shown in Table II. The frequent recording of the œsophageal temperature made it possible to predict the after-drop. Typical records are shown in Figure II.

In the lighter patients, the initial temperature before cooling was usually low, the drop sudden and precipitous. In the heavier patients, the initial temperature tended to be higher, the drop gradual and prolonged.

Occlusion and Perfusion.

The duration of circulatory arrest averaged 6·5 minutes with a range from 4 to 9 minutes. The rate of perfusion of the coronary system averaged 34 ml. per minute, with a range from 0 to 60 ml. per minute. In the single patient with no flow, the needle was found later to be blocked by clot. This was due probably to retrograde blood flow from the aorta prior to occlusion. If related to body weights, the average perfusion rate was 1 ml. per kilogram per minute.

TABLE II.

Body Weight. (Kilograms.)	Rates of Temperature Change.[1]			
	Fall to 33·5° C.		Fall to 30–32° C., Average.	Rise to 35° C., Average
	Average.	Range.		
0–30	15	5–20	30	15
31–60	20	10–35	40	25
61–90	35	25–45	65	35

[1] Times in minutes to the nearest five.

Cardiac Arrhythmias.

Sinus bradycardia was invariable as the temperature fell. Supraventricular and ventricular extrasystoles were frequent but transient; they were related to manipulations of the heart, particularly the placing of tapes about the venæ cavæ.

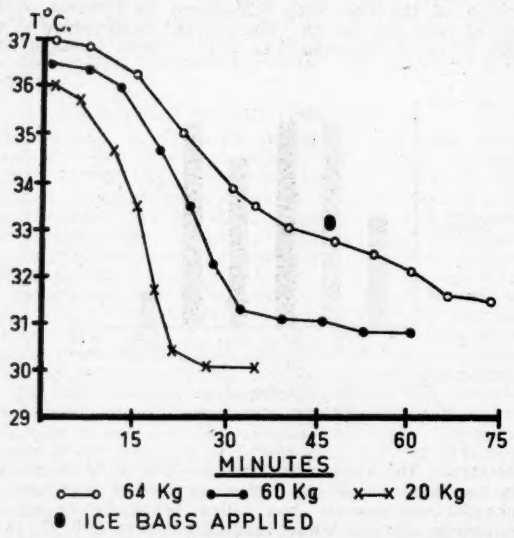

FIGURE II.

Temperature gradients related to body weight during cooling.

Auricular fibrillation was a frequent persistent arrhythmia. It arose in 26% of the cases as the temperature fell below 32·5° C., and often was precipitated by atrial manipulations. Probably because of depression of the atrio-ventricular bundle by digitalization and by hypothermia, the heart rate and systemic arterial tension were little affected. Spontaneous reversion to sinus rhythm occurred in all instances with rewarming at the end of the operation.

Ventricular fibrillation appeared on six occasions, or in 13% of those patients who were subjected to caval occlusion. Because of the serious nature of this arrhythmia, these cases will be described chronologically in some detail to reveal the probable ætiology. In each instance standard methods of resuscitation were used—manual systole, ventilation with oxygen, electrical defibrillation, warming the heart locally and intracardiac injections of adrenaline and/or calcium.

CASE 1, 1956.—The patient was a female, aged 34 years, weighing 60 kg., suffering from congestive cardiac failure. She remained in iced water till the œsophageal temperature fell to 29° C. Eventually, the after-drop ceased at 24° C. Caval occlusion lasted six minutes, but coronary perfusion was not in use at the hospital at this time. Ventricular fibrillation appeared soon after release of the caval tapes and resuscitation was continued for 70 minutes. As the œsophageal temperature rose to 30·5° C, the electric defibrillator succeeded in restoring normal sinus rhythm. There were no marked neurological sequelæ. This patient is alive today.

Excessive hypothermia and the lack of coronary perfusion in this case readily explain the occurrence of ventricular fibrillation.

CASE 4, 1957.—The patient was a male, aged 21 years, weighing 66 kg., suffering from severe exertional dyspnœa. Repair of the defect was carried out at 29·5° C. Caval occlusion lasted nine minutes. The coronary vessels were perfused with arterialized venous blood at 0·33 ml. per kg. per minute. Ventricular fibrillation appeared soon after release of the caval tapes, and resuscitation continued for 130 minutes. It was observed that the shocks delivered by the defibrillator did not produce arrest, so an electrical extension direct from the power point was connected to the electrodes. By the use of the wall switch, one shock was passed across the heart and sinus rhythm was restored. At this stage the temperature had risen to 34·5° C. Despite prolonged manual systole, which maintained a blood pressure between 50 and 70 mm. of mercury, there were no neurological sequelæ. The patient is alive today.

A long occlusion time and poor coronary perfusion explain the occurrence of ventricular fibrillation in this case. Subsequently, the failure of defibrillation was found to be due to a fault of the electrical circuit of the defibrillator.

CASE 7, 1958.—The patient was a female, aged 44 years, weighing 60 kg., with gross cardiomegaly. She was not digitalized. Auricular fibrillation appeared as the atrium was explored. Repair of the defect was carried out at 31·5° C. Caval occlusion lasted six minutes. The coronary vessels were perfused with oxygenated blood at 2 ml. per kilogram per minute. There were two episodes of ventricular fibrillation; the first occurred soon after release of the caval tapes and responded quickly to electrical defibrillation; the second occurred five minutes later despite normal arterial tension, and again responded to defibrillation with two shocks at 130 volts for 0·1 second. During closure of the chest, auricular fibrillation persisted, together with frequent ventricular ectopic beats. Ventricular tachycardia appeared early in the rewarming phase, and continued for 30 minutes till the œsophageal temperature rose to 34·5° C., when auricular fibrillation reappeared. This reverted to sinus rhythm 45 minutes later. There were no neurological sequelæ. On the ninth day after operation a sudden arrhythmia developed. Despite the administration of digoxin, cardio-vascular collapse followed.

The patient was not digitalized before operation. Coronary perfusion and pulmonary ventilation were adequate. Ventricular fibrillation was due probably to the effects of the period of circulatory arrest and of the hypothermia on a severely decompensated heart.

CASE 18, 1959.—A male patient, aged 10 years, weighing 26 kg., was suffering from severe exertional dyspnœa. Repair of the defect at 31·5° C. lasted five minutes, during which time 200 ml. of oxygenated blood perfused the coronary vessels. Ventricular fibrillation appeared after release of the caval tapes. Sinus rhythm was restored immediately with one shock of 160 volts for 0·1 second. There were no neurological sequelæ, and the patient is alive today.

There was no obvious defect of management to explain ventricular fibrillation on this occasion.

CASE 25, 1959.—The patient was a male, aged 25 years, weighing 65 kg., suffering from severe exercise intolerance. Repair of the defect at 30·6° C. lasted eight minutes, during which time 300 ml. of oxygenated blood perfused the coronary vessels. After release of the caval tapes, ventricular fibrillation appeared and resisted all resuscitative efforts. Manual systole was stopped after 60 minutes, owing to the complete lack of cardiac tone. At this stage brisk pupillary reflexes indicated continuing neural activity.

At the post-mortem examination in this case it was discovered that the surgical repair had obstructed the free flow of blood into the right ventricle.

CASE 40.—The patient was a female, aged 44 years, weighing 60 kg., and suffering from severe exertional dyspnœa. Repair of the defect at 32° C. lasted seven minutes, during which time 255 ml. of oxygenated blood perfused the coronary vessels. There were three episodes of ventricular fibrillation. The first occurred soon after release of the caval tapes, and with five minutes' resuscitation, sinus rhythm reappeared after two shocks of 220 volts for 0·1 second each. However, the systemic blood pressure did not rise above 80 mm. of mercury, despite accurate blood replacement. The second episode occurred five minutes later; again the electric defibrillator was successful in restoring sinus rhythm. The hypotension persisted, and the arterial pH was found to be 7·19, so a noradrenaline infusion was started and 40 mEq. of sodium bicarbonate were given intravenously. Before these had time to act, ventricular fibrillation appeared for the third time, but reverted to sinus rhythm after a short period of manual systole. The three episodes in all covered a period of 25 minutes. Noradrenaline was required for 24 hours after operation. For several days the patient remained mentally vague. A wound infection and sternal instability were noted on the eighth day after operation, and at thoracotomy suppurative mediastinitis and pericarditis were found. This staphylococcal infection proved mortal.

TABLE III.

Deaths and Complications in Whole Series of 46 Cases.

Deaths (11%).			Complications (40%).		
Cause.	Number of Cases.		Type.	Number of Cases.	
Operative:			Ventricular fibrillation..	6[1] (13%)	
Massive hæmorrhage and cardiac asystole	1	2	Auricular fibrillation (no trouble)	12 (26%)	
Ventricular fibrillation due to the repair ..	1		Post-operative:		
Post-operative:			Slight residual defects in personality ..	2	5 (10%)
Possible thrombosis or embolism	1	3	Mild renal tubular necrosis	1	
Sudden arrhythmia (? embolic)	1		Thoracotomy required for hæmorrhage ..	1	
Staphylococcal infection	1		Temporary thyroid enlargement	1	

[1] Three deaths, one operative, two post-operative.

In the cooling phase, bradycardia was not as pronounced as usual, and the systemic tension, instead of remaining normal, rose, particularly as the chest was entered. In retrospect, these signs may have indicated an insufficient inhibition of the responses to cold. However, the mechanical pulmonary ventilation of 20 litres per minute should have been sufficient to prevent any pre-occlusion acidosis. The pH of the perfusion blood was 7·20 instead of 7·40. Owing to an error, it had been collected 12 hours earlier than usual and refrigerated. Metabolic acidosis of the patient and of the perfusion blood may have contributed to the production of ventricular fibrillation.

Mortality and Complications.

These are indicated in Table III. None of the deaths could be regarded as "hypothermic". Post-operative thrombotic tendencies have been described after these operations (Swan, 1959), and anticoagulation therapy has been employed as a routine measure. In this series there were no definite episodes of infarction, although the possibility exists in two cases.

Discussion.

The surface cooling method has proved simple and efficient. The rate of cooling is rapid and more than twice that provided by the cooling blanket in use with our neurosurgical patients, so that the operation time is not prolonged unduly. Early, complete relaxation by tubocurarine and peripheral vasodilation with cyclopropane are responsible for the smooth, rapid fall of body temperature. The cyclopropane is excreted rapidly by the use of high nitrous oxide-oxygen flow rates before the diathermy is needed. Cardiac arrhythmias have not accompanied the use of a 25% mixture of cyclopropane in oxygen.

The after-drop can be predicted with reasonable accuracy. Excessive hypothermia has not been a problem except in the first case of the series. In operations on children, œsophageal readings should be taken every 30 seconds to detect the onset of the rapid fall, for only a few minutes then elapse before removal from the dinghy becomes necessary. With infants, to provide greater control of the speed of cooling, it would seem advisable to use water at 10° C. rather than at 3° C. There have been no instances of superficial cold injury.

The active rewarming in water at 45° C. results in a rapid elevation of body temperature. This ensures an early return of consciousness and, more important, the early resumption of adequate spontaneous respirations; as well, auricular fibrillation invariably reverts to sinus rhythm. During rewarming, complications such as systemic hypotension and gross shivering with acidosis (Fairley, Waddell, Bigelow, 1957) have not been encountered. There have been no instances of superficial burns. If the treatment of ventricular fibrillation necessitates an elevation of temperature during operation, saline at 40° C. poured directly into the chest proves the quickest method to achieve this in the absence of an extracorporeal circulation of blood.

The safety of such rapid changes of body temperature and of the brief period of circulatory arrest depends greatly upon the continual hyperventilation, which maintains the arterial pH steady between 7·6 and 7·7. This has been accomplished without any systemic hypotension, with both manual and mechanical methods, for care was taken with the "wave form" of the respirations as suggested by Gordon, Frye, and Langston (1956). When hypothermia deepens, it becomes easy to produce marked respiratory alkalosis with an arterial pH and partial pressure of carbon dioxide in the vicinity of 7·9 and 15 mm. of mercury respectively. This is undesirable because of the marked cerebral vasoconstriction and poor dissociation of oxyhæmoglobin that result (Kety and Schmidt, 1956), so as soon as possible after the chest is opened, a pulmonary vein blood sample should be taken for estimation of the pH. The pulmonary ventilation may be adjusted, if necessary, to provide a pH of 7·6 just prior to circulatory arrest.

Although induced hypothermia lowers over-all oxygen consumption, the decrease of metabolism affects most organs more than the heart itself (Gray, 1958). Perfusion of the coronary vessels during the period of arrested circulation aims at avoiding myocardial damage by providing oxygen and removing metabolites. Thus it is hoped to diminish the incidence of ventricular fibrillation (Maloney, Marable and Longmire, 1957). The most physiological perfusate available is compatible freshly collected heparinized blood. In providing this, together with large quantities of citrated blood, the Red Cross Blood Bank has been most cooperative. Despite adequate refrigeration, this heparinized blood develops microclots and acidosis if stored for any length of time. On two occasions, owing to errors in liaison with the Blood Bank, a donor was bled 12 hours instead of two hours before operation. In one of these cases, the pH of the blood just before use was 6·67, but no complication arose. In the other, the pH of the blood before use was 7·20, and ventricular fibrillation occurred after release of caval occlusion. To assume a relationship of cause and effect may not be justified; nevertheless, the use of fresh blood seems imperative, as

its pH and serum electrolyte concentrations are normal. Estimations of the glucose content of the heparinized blood have ranged from 50 to 400 mg. per 100 ml., and a reliable method to ensure the higher levels is under review at the moment.

Arterialized venous blood does not reach 90% saturation invariably, as was suggested by Warden *et alii* (1955). However, the use of artificially oxygenated blood can ensure full saturation with oxygen. A very high oxygen pressure in the bottle, although rapidly successful in achieving 100% saturation of hæmoglobin, can result in excessive tension of oxygen in the plasma. If this blood is perfused into the cold heart, oxygen emboli may form. Rapid oxygenation means high pressure in the bottle; therefore, if the dangers of oxygen embolism are to be avoided, at least a 10-minute period should be required for agitation of the blood to complete the oxygenation. The temperature of the perfusate should not exceed that of the hypothermic heart. Normally the coronary circulation accounts for 5% of the cardiac output, or about 5 ml. per kilogram of body weight per minute. A flow of 3 ml. per kilogram per minute would seem adequate to nourish the myocardium in these patients, considering the 40% reduction of metabolsim that accompanies the fall of temperature to 30° C. If these empirical calculations are correct, the mean coronary flow of 1 ml. per kilogram per minute in this series was inadequate. Although the incidence of ventricular fibrillation has not been excessive, in the future it has been decided to increase the rate of coronary perfusion. Thus a litre of heparinized blood may be needed on occasions, and it will be necessary to apply positive pressure to the perfusion bottle. It remains to be seen whether a decreased incidence of ventricular fibrillation results, for the increased blood flow into the right atrium from the coronary sinus, by obscuring the surgeon's view of the defect, may well necessitate a more prolonged occlusion time. A significant decrease in the incidence of this arrhythmia following the higher perfusion rates would emphasize the merit of the technique. It must be remembered that in certain centres excellent results are obtained without its aid.

H. G. Swan (1959) injects 1:4000 neostigmine solution into the coronary vessels to slow the heart during the period of occlusion. The latter is not allowed to exceed six minutes. If repair of the defect is not completed in this time, the circulation is restored for 10 to 15 minutes, and then a further six-minute period of occlusion is permitted. During the whole procedure Swan infuses a 5% to 10% dextrose solution, producing deliberate hyperglycæmia. It is held that this nutrient supports myocardial activity during hypothermia. In Swan's last 46 cases of secundum atrial septal defect, the mortality was zero, and he emphasizes the importance of the completely bloodless heart and the short periods of occlusion. The perfection of this technique with neostigmine could well entail episodes of cardiac standstill, which Swan encountered early in his prodigious hypothermic series. Cardiac standstill has not been a problem at this hospital, where a single period of occlusion is employed.

Immediately after release of the caval tapes, the systemic arterial tension rises rapidly, at times exceeding 200/100 mm. of mercury. All patients who developed this post-occlusion hypertension gave no cause for alarm and gradually became normotensive over a period of 10 to 15 minutes. In the four cases in which post-occlusion hypotension occurred, the cardiac contractions remained sluggish and irregular. In one, ventricular fibrillation supervened. The cause of this post-occlusion hypotension was rapid blood loss in two cases, inadequate pulmonary ventilation in one case and unexplained acidosis in one case. After manual systole and the correction of these defects of management, the circulation was restored eventually in all four cases. The value of heparinized over citrated blood for rapid replacement in the hypothermic patient has been emphasized already (Swan *et alii*, 1955), and in one of the two patients who received over 2 litres of citrated blood, the hypotension persisted despite a positive blood balance until calcium was administered intravenously. Now, as a routine, 15 mEq. of calcium are administered intravenously for every 1·5 litres of citrated blood. The dangers of citrate intoxication have been reviewed recently (Howland, 1958) and seem to be much greater in the hypothermic state, despite the relatively large pool of calcium readily available in the bones.

Although metabolic acidosis may not be the precipitating cause of poor cardiac action after occlusion, a period of hypotension or of complete circulatory failure requiring manual systole may lower the arterial pH to such a degree as to prejudice successful resuscitation. This acidosis may arise despite maximum hyperventilation. If initial attempts at resuscitation fail, and particularly if ventricular fibrillation is present, a sample of arterial blood should be collected for determination of pH. If this has fallen below 7·3 units, a 7·5% solution of sodium bicarbonate is given intravenously to neutralize the circulating acid metabolites. Sodium bicarbonate contains approximately 12 mEq. of sodium per gramme. To raise the pH by 0·1 unit, it is necessary to raise the extracellular sodium by 10 mEq. per litre. A rapid method of estimating the intravenous dose of bicarbonate in grammes to accomplish this is to divide the body weight of the patient in kilograms by 6. A further estimation of arterial pH is advisable after 20 or 30 minutes, to assess the adequacy of reversal of the acidosis.

If strong cardiac contractions do not return despite effective pulmonary ventilation, adequate blood replacement and a normal acid-base balance, and despite the aid of an infusion of nor-adrenaline, it should not be forgotten that the attempt to repair the septal defect may have obstructed the free flow of blood into or through the heart. As a last resort, an exploration of the atrium should be considered, for the death of one patient in this series was due to an error in the repair.

During the period of arrested circulation, the patient's face becomes purple, and the pupils are widely dilated and unresponsive to light. Within 30 minutes of recommencing ventilation with oxygen, all patients have small pupils reacting briskly to light, active tracheal reflexes and spontaneous swallowing movements. Before completion of the operation, movements of the head and limbs are seen despite the analgesia produced by nitrous oxide and respiratory alkalosis. At this stage, no attempt is made to deepen anæsthesia or increase muscular relaxation, for hyperventilation can still be accomplished with ease.

Despite the protection offered by hypothermia, evidence of hypoxic tissue damage, predominantly neural, appears whenever the period of circulatory arrest exceeds six minutes. There is a delay in the return to consciousness with a phase of characteristic irritability, during which the patient becomes noisy and restless. However, all patients were rational within six hours after operation, except two patients who had been subjected to prolonged hypotensive episodes associated with ventricular fibrillation. These two remained stuporose for 12 hours, and although they eventually returned to full consciousness, they retained permanent evidence of neural damage in the form of subtle changes of personality. In one case, an episode of renal ischæmia with anuria and azotæmia in the post-operative period occurred. In one child, a symptomless thyroid enlargement appeared, which subsided gradually over a period of six weeks.

Post-operative hæmorrhagic diatheses have not been encountered in this series; in fact, blood loss has been minimal in this period, only one patient requiring a second operation for hæmorrhage. Thrombotic or embolic episodes were suspected in only two cases and anticoagulants have not been employed as a routine measure as suggested by Swan (1959). Both suspects died suddenly about 10 days after operation; unfortunately post-mortem examinations were denied.

The problem of staphylococcal disease at this hospital has been reviewed recently by Hassall and Rountree (1959). Post-operative wound infections due to resistant staphylococci are likely to prove disastrous in the mediastinum or pericardial sac. A complete discussion of this serious and difficult problem here would be out of place; suffice it to say that one death in the series was due to suppurative

mediastinitis and pericarditis, and that very close liaison should be kept with a pathologist experienced in the hazards of cross infection if prevention is to be successful.

The over-all mortality rate of 11% and the 13% incidence of ventricular fibrillation would not seem excessive, considering the initial figures from other centres, which have usually been in the vicinity of 15% (Swan, 1959) and considering the age distribution of this series, in which two-thirds of the patients were older than 20 years. However, the mortality rate is too high in comparison with the 2% over-all mortality rate that is being attained elsewhere at the present time (Swan, 1959). With growing experience in this technique, and provided that patients are referred for surgery before gross cardiac decompensation has occurred, the inherent risks of the operation should become almost negligible.

Summary.

1. The status of hypothermia in cardiac surgery is reviewed.

2. Forty-six atrial septal defects have been repaired at this hospital, induced hypothermia and coronary perfusion being employed.

3. A description of over-all management is given, with consideration of pre-operative preparation, anæsthesia, cooling and rewarming, and coronary perfusion.

4. The commonest major cardia arryhthmia was auricular fibrillation which appeared in 26% of patients as the temperature fell below 32·5° C. There were six episodes of ventricular fibrillation, an incidence of 13%. Each episode is described briefly. One proved fatal.

5. There were five deaths, two operative and three post-operative, an over-all mortality of 11%. None were truly "hypothermic".[1]

6. The value of hyperventilation to produce respiratory alkalosis is stressed. Certain problems with coronary perfusion and the significance of post-oclusion hypotension are discussed. The hazard of staphylococcal wound infection is emphasized.

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[1] Since this article was submitted for publication, a further 28 secundum atrial defects have been repaired under hypothermia with no deaths.

PROFOUND HYPOTHERMIA IN CARDIAC SURGERY: A PRELIMINARY REPORT.

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FOR the past three and a half years experimental open heart surgery has been carried out in Perth with the use of a bubble oxygenator. During this time various methods combining cardio-pulmonary by-pass and the reduction of metabolic requirements, with a view to reducing the difficulties and dangers of the procedure, have been considered, and when Drew *et alii* (1959) described a technique of achieving profound hypothermia without an oxygenator and using low flows through his extracorporeal circuit, it was decided to develop this method.

A series of animal experiments was begun, and it was gratifying to find that the survival rate was very much higher than with the ordinary pump-oxygenator by-pass. In the non-survivors, death was due to three causes: hæmorrhage, pulmonary œdema and profound acidosis. It seemed that hæmorrhage was mainly due to the use of large volumes of blood substitute to prime the pump. Since this was realized there has been no serious post-operative bleeding. Pulmonary œdema probably resulted from the incorrect placement of the cannula in the left atrium, with mechanical obstruction to drainage of blood from this chamber and the production of higher than normal left atrial pressures. The acidosis appeared to increase in intensity with the length of time during which the circulation was stopped, and to decrease with the depth of hypothermia during the period of occlusion. It was considered to be due to continued body metabolism at a reduced rate at the lower temperatures, and was the principal cause of death. The intravenous use of sodium bicarbonate during the rewarming phase, in amounts regulated by frequent blood pH estimations, has simplified the problem of acidosis.

It was considered, however, that Drew's method was not easily applicable to all clinical cases, particularly those of pulmonary or infundibular stenosis, or in which ventriculotomy was not required for the approach to the lesion. A simple bubble oxygenator was therefore incorporated in the circuit, to eliminate the need to cannulate the pulmonary artery; this, though technically an easy procedure, was thought to be potentially the most dangerous (Figure I).

This technique, not unlike that described by Kenyon *et alii* (1959), was used in another series of experiments. The results were on the whole good, but on three occasions in 10 experiments pulmonary œdema developed, and it was fatal in one of these three. To avoid the possibility of left atrial distension while the heart was in asystole or ventricular fibrillation, especially in subjects with increased bronchial flow, the left atrium was cannulated and drained, and in the following 10 experiments pulmonary œdema did not occur.

Machine.

Our present machine is a combination of a modified bubble oxygenator (DeWall *et alii*, 1956; Cooley *et alii*, 1958) and the Duke University heat exchanger (Brown, Smith and Emmons, 1958). (Figure II.) The venous reservoir lies at an adjustable height, usually 30 cm. below the atrial level, and is filled by gravity. The blood is pumped from here by a "Sigmamotor" pump to the bottom of a bubbling column 85 cm. in height and 2·5 cm. in diameter. A mixture of 95% oxygen and 5% carbon dioxide enters at this point, and the oxygenated foam rises into a two-pint debubbling chamber filled with six domestic nylon pot-scrapers which have been pretreated with silicone A. Further debubbling and storage of blood are then provided by a three-loop helix, 2·5 cm. in diameter, which leads to the heat exchanger. The exchanger consists of 24 stainless steel tubes of 20-gauge bore, 60 cm. in length and set in parallel to provide a large surface area for heat exchange,

These blood-filled pipes are totally enclosed in a jacket through which hot or cold water circulates. The exchanger is mounted with a one in four incline rising to the distal end, which is connected to a filter and simple bubble trap. From here a "Sigmamotor" pump propels the blood through the arterial cannula. The machine is primed from normal hospital transfusion equipment into the venous reservoir, and requires only four pints for adequate filling.

The exchange fluid — water at 1·5° to 2° C. during cooling and at 40° to 44° C. during heating — is circulated by a small centrifugal pump. The machine is portable and can be operated manually in the event of a power failure. The equipment is constructed from stainless steel and disposable "beverage" tubing, and, apart from the "Sigmamotor" pumps, was made and assembled in the Royal Perth Hospital workshops.

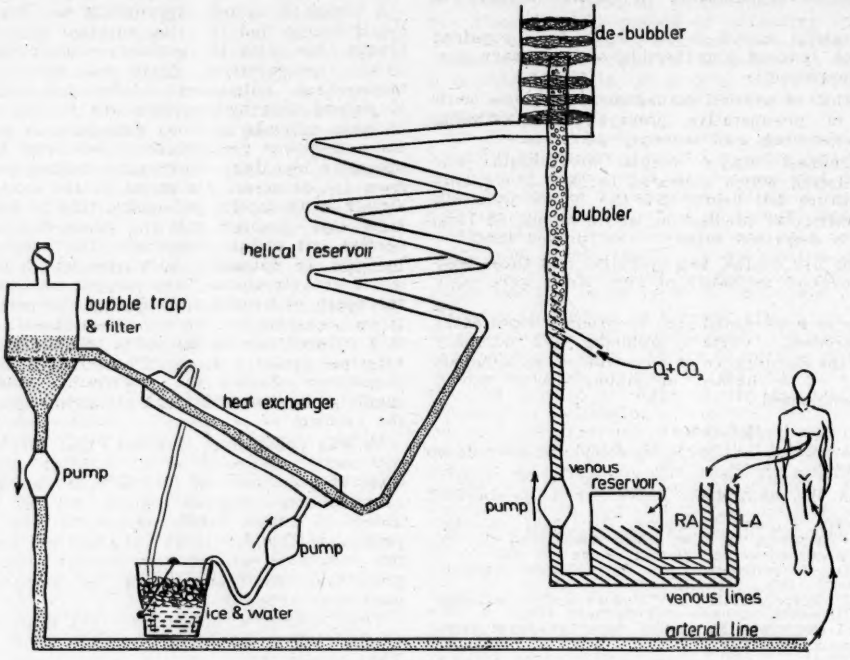

FIGURE I.

Diagram of the extracorporeal circulation used for inducing profound hypothermia.

Technique.

In the technique now used, a low flow partial by-pass (approximately 30 to 50 ml. per kilogram per minute) is first commenced, blood being taken from the right atrium, pumped through the machine, and returned to the femoral artery. When cooling has caused ventricular fibrillation or cardiac asystole, usually at 28° to 25° C., the machine takes over the total by-pass, still at a low flow rate, and the left atrial cannula is opened to drain bronchial blood into the venous reservoir. In most of the experiments, cooling has been to 15° C. in the pharynx, at which temperature the heart temperature is between 7° and 10° C. During cooling, there is almost invariably a loss of a small amount of blood from the machine into the animal. This has been shown (Rodbard, Saiki, Malin and Young, 1951) to be due to altered autonomic responses at low temperatures. The blood is usually recovered during the rewarming phase. When cooling has been completed, the artificial circulation is stopped, the heart is drained into the venous reservoir, and the venæ cavæ are occluded. The conditions for intracardiac surgery are now ideal: the heart is quiet and empty with no coronary flow, there is no artificially supported circulation to distract the surgeon from his immediate task, and there are at least 45 minutes available for the completion of the actual surgery. After the cardiac wounds have been closed, the by-pass is again commenced, warm water being circulated through the heat exchanger. If necessary, electrical defibrillation is carried out when the temperature of the heart reaches 30° C., and the left atrial cannula is then occluded. Rewarming is continued on partial by-pass until the pharyngeal temperature is about 37° C.

Report of a Case.

In October, 1959, we first used this technique on a patient referred by Dr. T. B. Cullity from the cardiology department of the Fremantle Hospital.

The patient was a woman, aged 32 years, who was known to have Fallot's tetralogy. Over the previous few months she had suffered increasing exertional dyspnœa, and was becoming incapacitated. She was deeply cyanosed, the hæmoglobin value was 26 grammes per 100 ml., the packed cell volume was 75%, and she had gross clubbing of the fingers and toes. The chest X-ray films suggested complete absence of the left pulmonary artery. This was confirmed by an angiocardiogram, which also demonstrated infundibular stenosis and a right pulmonary artery of reasonable size. The small left lung was receiving blood only from the bronchial circulation. If this patient had two pulmonary arteries, a shunt operation would have been advised; but the risk of even partially occluding the only pulmonary artery for the rather long time necessary to carry out a vascular anastomosis seemed to be too great. It was decided that infundibular resection under profound hypothermia would be the operation of choice, possibly to be followed by closure of the ventricular septal defect at a later date, rather than completion of the repair in one stage (Brock, 1959).

The chest was opened by a standard bilateral anterior transverse thoracotomy incision, and the heart exposed by a wide incision in the pericardium. The gradient across the infundibular stenosis was measured, the right ventricular pressure being 60 mm. of mercury and the infundibular pressure 10 mm. of mercury. By the time that the cannulations had been completed and all was ready for the by-pass to commence, the temperature had fallen to 34° C. Cooling was rapid, and after five minutes on by-pass, ventricular fibrillation occurred. The pharyngeal temperature at this time was 30° C. and the temperature of the heart 12° C. (Figure III). Total by-pass was thus established, and the left atrial cannula was then opened. Cooling continued for

a total of 15 minutes, until the pharyngeal temperature was 18° C. The pump was then stopped, the venæ cavæ were occluded and the heart was drained of blood. The infundibulum and ventricle were opened, and the obstruction was found to be a muscular diaphragm with a central opening about 0·5 cm. in diameter. The pulmonary valve was normal, and the ventricular septal defect was clearly seen.

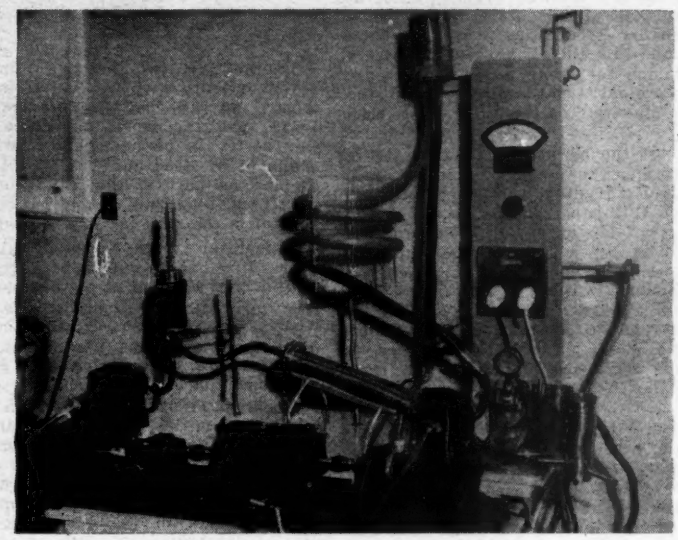

FIGURE II.
Photograph of the assembled apparatus.

Ideal operating conditions—a bloodless field and a practically motionless heart—made it easy to perform adequate resection of the infundibular stenosis. The heart was then filled with blood by temporarily releasing the inferior vena cava, and the ventricular wall was sutured.

By-pass was started again after an occlusion time of 12 minutes, and after 7 minutes' rewarming, when the pharyngeal temperature was 19·5° C. and the heart temperature was 30° C., defibrillation was carried out with one shock. The left atrial cannula was clamped, and rewarming was continued on partial by-pass with the heart beating normally until the pharyngeal temperature reached 36° C. The total rewarming time was 24 minutes. Within five minutes of cessation of the by-pass, the patient was maintaining a blood pressure of 80 mm. of mercury. The cannulæ were removed and the pressures again measured. The right ventricular pressure was 60 mm. of mercury and the infundibular pressure 50 mm., an alteration of gradient from 50 to 10 mm. of mercury. The patient's temperature dropped a little until the chest was closed, but thereafter rose satisfactorily, and within a few minutes of completion of the operation she was conscious and talking.

Immediately after the operation she was pink, and her colour has remained good. Her post-operative progress has been relatively uneventful. She has evidence of a large left-to-right shunt and had moderate right ventricular failure, which responded to bed rest and the administration of digitalis. She was discharged from hospital, well, six weeks after operation.

Discussion.

In the animal laboratory many advantages of this method of profound hypothermia and its application to cardiac surgery have become evident. The cannulations are simple, the extracorporeal circulation is easily controlled by one operator and the conditions for intracardiac manipulations are ideal.

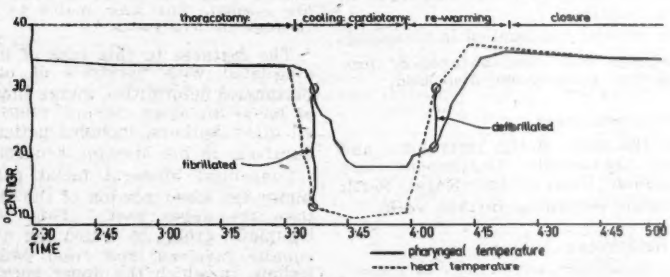

FIGURE III.
Chart showing the pharyngeal and heart temperatures during operation. During cooling, ventricular fibrillation occurred at a pharyngeal temperature of 30° C., at which time the temperature of the heart was 12° C. During rewarming, defibrillation was carried out when the heart temperature was 30° C. and the pharyngeal temperature 19·5° C.

The margin of safety is high. At normal temperatures partial by-pass only is used, and at lower temperatures, when the by-pass may become complete because of ventricular fibrillation or asystole, a comparatively low flow rate is adequate to maintain satisfactory oxygenation.

Such a low flow rate has other advantages, notably technical simplicity of management, less blood cell destruction and a reduction in priming volume. Only four pints are required to prime the machine, and as the volume of work increases, this factor will become more important to our blood banks.

In most of our animal experiments there was a period of circulatory occlusion lasting from 30 to 45 minutes at 15° C. Once, owing to surgical misadventure, the occlusion time was extended a further 20 minutes, making a total of 65 minutes at 15° C., and this did not affect the recovery of the animal. Re-occlusion for many minutes to secure hæmostasis has been necessary on occasions after the rewarming has begun, and the outcome has not been noticeably affected.

It is realized that as yet the method is not ideal. The operation is time-consuming, the by-pass occupying half to one hour, and this is a disadvantage in the type of short clinical case described in this paper. However, when the critical occlusion time available at various temperatures has been determined, it is hoped that the patient may have to be cooled only to the temperature at which the expected period of occlusion can be safely undertaken, and this will reduce the by-pass time. Alternatively, it may be found to be desirable to continue body perfusion at low temperatures while the intracardiac surgery is carried out. The extreme depth of temperature may then be unnecessary so that the cooling and rewarming times can be reduced.

Other disadvantages are evident—for instance, the impossibility of measuring pressures in the heart and great vessels after corrective surgery until rewarming has been completed and the by-pass has ceased. In addition, one patient was encountered who had cold agglutinins in his blood, and because of this the risk of using profound hypothermia was considered too great and surgery was undertaken with the use of the conventional cardiopulmonary by-pass.

Although the method appears safe and easy in the experimental animal, we realize that many of the physiological changes which occur during profound hypothermia are still unknown. Further experiments to elucidate some of the problems have been planned. However, while these experiments are being conducted, we believe that our experience with this method justifies its continued use.

Summary.

1. The development of a method of profound hypothermia is outlined, and the equipment and technique in present use in Perth are described.

2. A case in which this method was applied is presented.

3. Some of the advantages and disadvantages of profound hypothermia in cardiac surgery are discussed.

Acknowledgement.

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CONGENITAL FACIAL DIPLEGIA.

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In the past two years we have personally examined seven patients with congenital facial diplegia. Only one Australian case has been previously reported (Robertson, 1953), and the world literature records less than 120. Our series is of added interest in view of the recent comment by Reed and Grant (1957) that heredity appears to play no part in this condition. This is a commonly held belief, yet two of our patients are first cousins and a third is the outcome of a consanguineous marriage.

Congenital neuro-muscular abnormalities of cranial nerve distribution may appear as isolated lesions, or in a bewildering assortment of possible combinations. The fact that congenital facial diplegia is so commonly associated with paralysis of other cranial motor nerves (particularly a bilateral abducens nerve palsy) and with peripheral abnormalities has singled this group out as a separate syndrome.

Moebius (1892) correlated facial paralysis with the other deformities, and the syndrome is often given his name, although congenital bilateral facial palsy was first described by A. Von Graefe in 1880. The majority of subsequent papers have followed a common pattern: a report of a case, repetition of popular ætiological theories, and a review of the literature. The most exhaustive surveys, including the clinical minutiæ, have been made by Henderson (1939) and Danis (1945).

Clinical Features.

Facial paralysis is common at birth, but almost every case is clearly due to obstetric damage and the condition is rarely bilateral. Unilateral facial paralysis can occur in the absence of birth trauma and may be associated with other congenital deformities.

A., a girl, is now seven years old (Figure I, 1). She displays a right facial nerve palsy and bilateral sixth nerve palsy, both of lower motor neuron type, paralysis of the left side of the palate and tongue, and syndactyly in both hands. There is no other facial deformity, and the ears are normal. She was unable to close her right eye until the age of five years.

The features in this case of unilateral facial paralysis, associated with paralysis of other cranial nerves and peripheral deformities, merge imperceptibly with the group of facial diplegias. Evans (1955), in contradistinction to all other authors, includes patients with unilateral facial paralysis in his Moebius syndrome series.

Congenital bilateral facial palsy is frequently incomplete; the lower portion of the face is usually less affected than the upper part. This distinguishes it from the traumatic group, in which the upper and lower parts are equally involved, and from palsies due to supranuclear lesions, in which the upper portion of the face is spared.

The boy in Case II illustrates the typical facial appearance, with its characteristic lack of expression (Figure I, 2).

Bilateral abducens palsy, when present, is often of a distinctive character, there being an inability to abduct either eye beyond the mid-line, associated with paralysis of conjugate horizontal movement. Unlike the usual sixth-nerve palsy, horizontal nystagmus cannot be provoked by caloric or rotatory tests. All four of our cases in which sixth-nerve palsy was present fulfilled these criteria (see Table I).

Of the other cranial motor nerves, the hypoglossal is most commonly involved—three of the seven cases in this series. Other relatively common abnormalities include

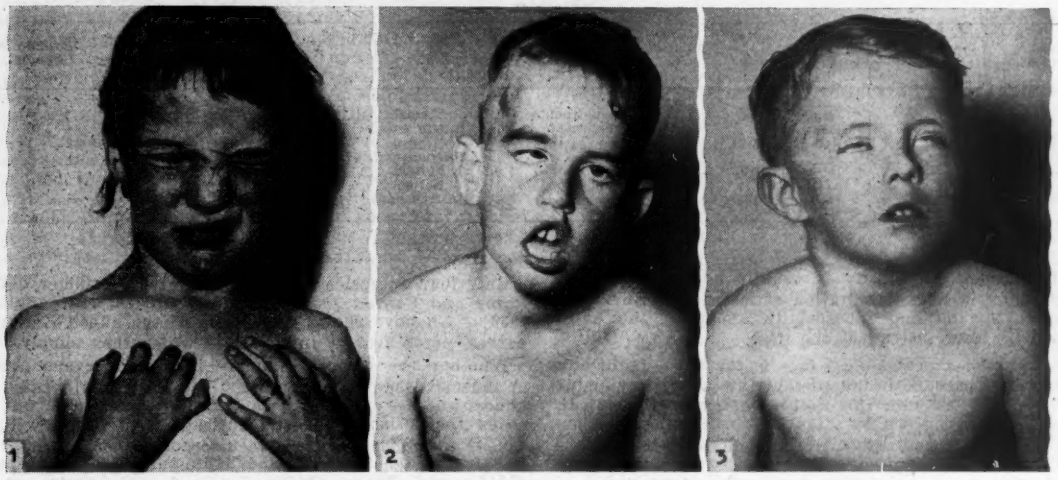

FIGURE I.

1. Patient A: unilateral facial paralysis and syndactyly. 2. Patient in Case II, showing characteristic lack of expression. 3. Patient in Case IV, attempting to close eyes and mouth.

club-feet and pectoral muscle and brachial deformities. One of our patients had bilateral talipes equinovarus, another has severe syndactyly, and a third has marked valgus deformities of the distal phalanges of the great toes, a most unusual congenital defect (Gallagher, 1958).

Mental Defect.

Numerous authors mention mental defect occurring in their patients, but without adequate substantiation. In the majority there is evidence that the disability is the psychological and social effect of their unfortunate vacant appearance, open mouth and dysarthria. Only two of our *patients (Cases II and III) show any mental retardation,* and both are very conscious of their defects, will not talk because they cannot be understood, and are zealously over-protected by their parents. *Psychological tests show that* the degree of defect is certainly not as gross as a cursory *examination suggests.*

Diagnosis.

The immobility of the face, incomplete closure of eyelids when asleep, open mouth and inability to suck are characteristic. It is commonly stated that *these features make* the diagnosis apparent at birth. We have found this to *be a most unusual occurrence.* There is normally paucity of expression in the new-born, symptoms are not produced by the lagophthalmos owing to the normal upturning of the eyes during sleep, *and an open mouth is a common* occurrence in infants, even in the absence of nasal *obstruction.* Failure to take the breast is attributed to faulty lactation, and as swallowing is normal, bottle feeding with a wide-bore teat presents no problems even *in the presence of a paretic tongue.*

The parents may first begin to worry when the child *fails to develop normal speech.* However, the family soon learns to interpret his dysarthria. In those patients with ocular palsy a convergent squint is seldom present at

TABLE I.

Summary of Clinical Features.

Case Number.	Sex.	Age (Years) by 1958.	Facial Palsy Distribution[1].	Abducens Palsy. Right.	Abducens Palsy. Left.	*Conjugate* Horizontal Paralysis.	*Induced* Nystagmus.	*Concomitant* Convergent Squint.	*Lingual* Palsy.	Intelligence.[2]	Other Malformations.	Family History.
I	M.	4	C/P | C/P	−	−	−	+	+	−−	Average.	—	Parents first cousins.
II	M.	11	C/C | C/C	−	−	−	+	+	−+	*High-grade* mental defective.	—	*First cousin to* patient in Case III.
III	M.	10	C/C | C/C	−	−	−	+	−	−−	Below average.	—	First cousin to patient in Case II.
IV	M.	6	C/C | C/C	+	+	+	−	−	++	Above average.	Club foot.	——
V	M.	12	C/C | C/P	+	+	+	−	−	++	Average.	Epicanthus.	——
VI	F.	13	C/C | C/C	+	+	+	−	−	−−	Above average.	Epicanthus, bilateral hallux valgus.	——
VII	M.	20	C/C | C/C	+	+	+	−	−	++	Above average.	Syndactyly.	First cousin has hemimelia.

[1] C, complete; P, partial.
[2] Assessed on Binet I.Q., developmental and social history and school record.

Table II.

Case Number.	Sex.	Date of Birth.	Pregnancy.	Delivery.	Maternal Age. (Years.)	Number in Family.	Position in Family.
I	M.	January, 1954.	Uncomplicated.	Normal.	33	4	3
II	M.	June, 1947.	Uncomplicated.	Instrumental.	30	6	6
III	M.	February, 1948.	Uncomplicated.	Normal.	32	1	1
IV	M.	May, 1952.	Uncomplicated.	Instrumental.	41	3	3
V	M.	January, 1946.	Uncomplicated.	Normal.	45	4	4
VI	F.	April, 1945.	Uncomplicated.	Normal.	27	2	1
VII	M.	December, 1938.	Uncomplicated.	Instrumental.	25	3	1

birth. It may be noticed at the age of six to nine months, but the cosmetic deformity is usually not great. Even though there is severe limitation of lateral movements of the eyes, this is not superficially apparent, the child turning the head instead of the eyes.

Although the expressionless face is the most disturbing symptom, the parents do not present this as the complaint to be treated. As with the mothers of mental defectives, they hide their concern by attention to the other defects, relieving their anxiety by this act of self-deception. These patients then may present themselves to a wide variety of clinicians, as is illustrated by the following case.

C., a boy (Case IV), was first examined by us at the age of five-and-a-half years (Figure I, 3). The obstetrician who attended his birth observed bilateral talipes and internal strabismus. When he was aged two years, his mother consulted a pædiatrician, who referred the boy to an orthopædic surgeon, and an operation was performed on his club feet. Two years later he was taken to an ophthalmologist, who noted alternating internal strabismus, bilateral abducens nerve palsy and a refractive error. Spectacles were prescribed.

At this stage he was considered a partial spastic. He next attended an ear, nose and throat consultant, who noticed bilateral facial weakness and hypoglossal paresis with normal movement of the palate. He was referred to an audiometrist, and the hearing test gave a normal result. He was also thought to be backward, and was referred to a psychiatrist and thence to a psychologist for assessment. A Binet test showed that he was of above average intelligence. A speech therapist was next consulted, who observed dysarthric speech and an inability to laugh or cry in the normal way. He had also been attending a dental clinic, as extensive dental caries had resulted from food collecting in the labio-buccal sulcus. Altogether he had consulted at least ten people for treatment of varying aspects of the syndrome.

Investigations.

A variety of special investigations have been carried out in an attempt to elucidate the underlying pathology. Vestibular tests in the presence of sixth-nerve palsy invariably show absence of horizontal nystagmus, suggesting a lesion in the medial longitudinal bundle. Biopsy of the facial muscles has shown absence of muscle fibres (Richards, 1953).

Electromyography reveals diminished or absent action potentials in the affected muscles (Breinin, 1957; Van Allen and Blodi, 1958). Air encephalography has been performed by Murphy and German (1947) and by Hellstrom (1949). In each case widening of the basal cisterns was found.

Pathology.

Only four autopsies have been reported (Heubner, 1900; Rainy and Fowler, 1903; Spatz and Ullrich, 1931; Balint, 1936). All have shown hypoplasia of the affected cranial nerves, nerve trunks and muscles which they supply.

Whether the defect primarily involves nervous tissue or muscle tissue is not known. The subject is debated in almost all case reports, the arguments raised in favour of either theory being almost identical. Most recent writers favour a primary neurogenic disorder (Hicks, 1948; Van Buskirk, 1951; Sprofkin and Hillman, 1956). Richards (1953) and Evans (1955) summarize the evidence in favour of a basically muscular defect.

Incidence.

Why have so many cases appeared in Brisbane, a city with a population of 575,000? Few clinicians have had the opportunity of seeing more than one case. Alajouanine, Huc and Gopcevitch (1930) and Hicks (1948) each described four cases, and of Evans's nine patients seen at Great Ormond Street, only four had bilateral facial paralysis.

In the literature, males and females are equally affected; yet in our series there are six males to one female. This suggests that there may be a number of affected females in Brisbane whom we have not seen, and that the actual local incidence may be indeed higher than seven.

It is most likely that the disorder is much more common than is realized. When looked for, it may prove as frequent as the many diseases, such as Marfan's syndrome and phenylpyruvic oligophrenia, which were considered relatively rare twenty years ago, but which do not now excite undue interest as collector's pieces.

Ætiology.

An investigation of the ante-natal histories in our patients reveals no evidence of a local infective, nutritional or toxic factor. The dates of birth (see Table II) make it unlikely that an epidemic illness affecting the pregnant mothers is a causative factor. Minor disturbances in the early stages of pregnancy, which are commonly overlooked, can determine congenital abnormalities, and it cannot be said with finality that these did not occur. Until this syndrome is diagnosed soon after birth, retrospective studies with such long delays are inconclusive.

Genetic Aspects.

It is no simple matter to obtain accurate family pedigrees. After twenty minutes of detailed questioning about the relatives of the patient in Case I, it became

Table III.

Family History of Congenital Facial Diplegia.

Author.	Year.	Consanguinity.	Family Relationship.	Additional Clinical Features.
Thomas	1898	Not present.	Two brothers.	Deafness and unilateral ear deformity.
Koster	1902	Not known.	Two brothers.	Ear deformity and complete facial anhydrosis.
Beetz	1913	Present.	One male and two female siblings.	Two with bilateral sixth-nerve palsy, one with ptosis and trigeminal palsy, also peripheral deformities.
Cadwalader ..	1922	Parents first cousins.	Two sisters.	
Fortanier and Speijer	1935	Not present.	Three generations affecting 15 cases.	Ten bilateral, including four *formes frustes*.
Hicks	1948	Not known.	Mother and son.	Bilateral sixth-nerve palsy; son deaf and with peripheral defects.
Van der Weil ..	1957	Not present.	Six generations affecting 46 cases.	Mostly bilateral, sometimes as *formes frustes*.

apparent that his parents were first cousins, although they had previously denied any blood relationship. The mothers of the children in Cases II and III were sisters (see Figure II), and the family pedigree in this instance was also difficult to obtain, false information having been given even in official places to hide marital misdemeanours.

It is obvious that family details have not been investigated in most of the cases reported. Even so, we have been able to find seven authors who record a positive family history (Table III). In addition, four authors observed a family history of associated congenital defects (Lennon, 1910; Fry and Kasak, 1919; Hellstrom, 1949; Sprofkin and Hillman, 1956). These facts give strong support to a genetic hypothesis.

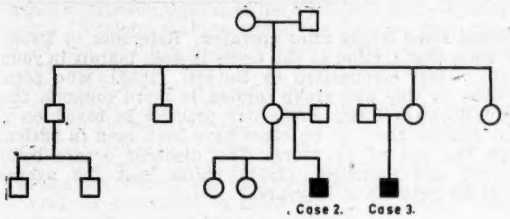

FIGURE II.
Family tree, Cases II and III.

From the limited information available, it is not possible to explain every case as the product of the same abnormal gene. In two families (Fortanier and Speijer, 1935; Van der Weil, 1957) the condition is undoubtedly caused by an irregular autosomal dominant gene, and Van der Weil (1958) has found other families reported in the European literature in which a similar mode of inheritance operates.

Hicks's cases suggest a dominant inheritance. Our Cases II and III may be due to a dominant gene with incomplete penetrance, or to a sex-linked recessive gene. As the condition occurs in first cousins, it would be difficult to explain its presence on any other basis. On the other hand, the occurrence of three groups (Beetz, 1913; Cadwalader, 1922; and Case I in our series) in which consanguinity was present argues in favour of a recessive gene in these particular instances. In only two groups (Thomas, 1898; Koster, 1902) is there any possibility of a maternal environmental factor operating to give rise to the disease in siblings.

Summary.

Seven cases of congenital facial diplegia are reported, this number indicating that the condition is much more common than has hitherto been realized.

The difficulties of diagnosis are discussed.

A genetic basis is postulated, and evidence is presented in favour of this theory.

Acknowledgements.

We wish to thank the many doctors who have given us access to their clinical records, especially Dr. Paul Spiro and Dr. Laurel Macintosh, who each referred patients to us. The work was supported in part by a grant from the Brisbane Clinic Research Foundation.

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TORSION OF THE TESTIS—A PLEA FOR BILATERAL EXPLORATION.

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TORSION of the testis was first recorded in 1840, when Delasiauve reported the finding of a gangrenous testis in the inguinal region of a man misdiagnosed as suffering from a strangulated inguinal hernia. This initial error was prophetic—torsion of the testis remains a diagnostic stumbling block to this day. The symptoms and signs of the condition were gradually recognized, and by 1901 Scudder was able to collect and record the essential clinical features in 32 examples of this condition. It soon became apparent that torsion of the testis was very likely to be misdiagnosed as acute epididymo-orchitis, and O'Connor (1933) concludes his review of 124 cases with an appeal for early surgical exploration. The literature now contains many papers supporting early operaton, and yet more than half of the cases recorded in this paper were misdiagnosed on initial examination. Being given a label of acute epididymo-orchitis, the patient is subjected to inappropriate treatment for various periods of time before an alternative diagnosis is entertained. Since the inflammatory changes associated with testicular necrosis will subside with the passage of time and in spite of the exhibition of antibiotic therapy, it would seem likely that an inaccurate

TABLE I.

Case Number.	Age. (Years.)	Initial Diagnosis.	Time Since Onset.	Operative Findings.	Procedure.	Anatomical Findings on Opposite Side.
I	18	Acute epididymo-orchitis.	3 days.	Dead testis.	Orchidectomy.	Bilateral abnormality present.
II	17	Acute epididymo-orchitis.	2 days.	Dead testis.	Orchidectomy.	Normal.
III	17	Torsion.	8 hours.	? Viable testis.	Untwisting, fixing.	Normal.
IV	18	Acute epididymo-orchitis.	4 days.	Dead testis.	Orchidectomy.	Bilateral abnormality present.
V	16	Acute epididymo-orchitis.	24 hours.	Dead testis.	Orchidectomy.	Normal.
VI	20	Torsion.	6 hours.	Dead testis.	Orchidectomy.	Normal.
VII	45	Torsion.	12 hours.	Acute epididymo-orchitis.	Exploration only.	Not explored.
VIII	15	Torsion.	6 hours.	Viable testis.	Untwisting, fixing.	Bilateral abnormality present.
IX	21	Torsion.	8 hours.	Acute epididymo-orchitis.	Exploration only.	Not explored.
X	22	Acute epididymo-orchitis.	3 days.	Dead testis.	Orchidectomy.	Bilateral abnormality present.
XI	17	Acute epididymo-orchitis.	5 days.	Dead testis.	Orchidectomy.	Normal.
XII	22	Bilateral failure of descent.	24 hours.	Torsion of seminoma.	Orchidectomy.	Undescended testis on pelvic wall.

diagnosis often remains undetected, the gradual subsidence of the inflammatory state being attributed to the treatment employed.

As will be shown later, most patients presenting with torsion lose their testis, and even if the scrotal contents are retained, it is unusual for normal spermatogenic activity to continue on the involved side. Since the disease occurs mainly in young males, it is essential for contralateral testicular function to be preserved.

Material.

Exploration of the testis has been carried out on 11 patients who have presented with a unilateral painful swelling of the testis of recent onset. Operation was undertaken in all cases, provided that (*a*) there was no

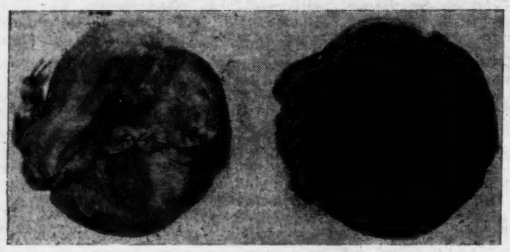

FIGURE I.
Photograph of the testis removed in Case XI. Both testis and epididymis are obviously necrotic, evidence of this being clearly seen on the exterior and on the cut surface.

associated urethral discharge, and (*b*) the onset of symptoms was not induced by operation on, or instrumentation of, the lower part of the urinary tract. In addition to these 11 cases, one more has been encountered (Case XII) in which abdominal exploration for bilateral failure of descent of the testis disclosed a torsion of a large seminoma of the retained testis. This young man had had abdominal pain for 24 hours before his admission to hospital, and at operation the tumour was found to be infarcted. He has survived for five years after resection and irradiation of the paraaortic nodes.

Of the 11 patients surgically explored, it will be seen that two were discovered to have unilateral epididymo-orchitis of bacterial origin (Table I). Exploration of these patients produced no untoward effects. The remaining nine patients all had torsion of the testis; in no less than six of these an initial diagnosis of infection had been made elsewhere, and had resulted in a period of pointless chemotherapy for a period of time ranging from 24 hours to five days. In all these cases a necrotic testis was found at operation, and all patients were treated by orchidectomy (Figure I).

Of three cases in which torsion was suspected on clinical grounds, and in which exploration was carried out within 12 hours, in two the testis seemed to be viable at operation, although obvious atrophy was present in one case reviewed some weeks after operaton. Reference to Table I will show that torsion of the testis is seen mainly in young adults, a fact emphasized by Burkitt (1956), who points out that in this age group torsion is more common than is epididymo-orchitis. Since our practice is based on an adult general hospital, no cases have been seen in patients below the age of 15 years. The disorder occurs before puberty, and Campbell (1951) states that the average age of all patients is 14 years.

Anatomical Abnormality.

In the 10 cases of torsion detailed in this paper, normal descent was present in all but one. The underlying anatomical abnormality was a shortening of the attachment of the mesorchium to the posterior scrotal wall. The tunica vaginalis extended upward behind both testis and epididymis, thus leaving the contents of the scrotum hanging freely within the tunica by a narrow pedicle, situated at the apex of the testis, and containing the spermatic cord (Figure II). The testis may also undergo torsion if the mesorchium is unduly lax and elongated, when rotation may occur in this long mesorchium. This type of anomaly seems to be much less common, and no example has been observed in the present series. Extravaginal torsion of the testis—that is, twisting of the whole

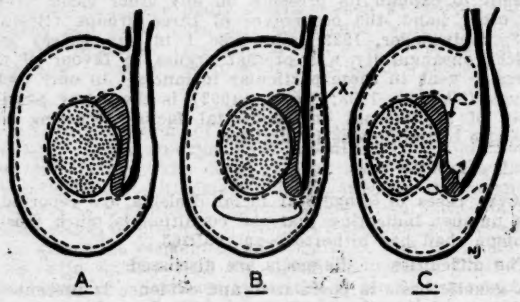

FIGURE II.
Series of diagrams indicating the arrangement of the tunica vaginalis in the normal testis and in cases of torsion. A: the arrangement in the normal testis; note that the mesorchium is short and is attached over the whole length of the testis. B: the common anomaly in cases of torsion. The mesorchium is attached only at the apex of the testis, which therefore hangs within the scrotal cavity by a narrow pedicle (x). In all cases in this series this abnormality was present. No example of torsion about an elongated mesorchium (C) was observed.

tunica vaginalis with its contained testis— is well documented (Longino and Martin, 1955); but this accident occurs only in the infant. Reference to the literature would suggest that imperfect descent is present in more than 50% of all cases of testicular torsion (Adams and Slade, 1958; O'Connor, 1933); but this association occurs more frequently in prepubertal patients, in whom errors of testicular descent are more common than they are in the adult population which provides the material for the present study.

It is much more significant to note that in all cases of torsion the opposite testis was explored simultaneously, and that in four of the nine uncomplicated cases the underlying anatomical abnormality was also present on the other side. Exploration in these cases has been carried out through a mid-line incision in the anterior aspect of the scrotum, and this approach affords easy access to both testes. If the abnormal anatomy is detected in the contralateral viscus, a simple Jaboulay operation will serve to fix the testis and thus prevent the risk of bilateral testicular torsion. No difficulty has been encountered with the healing of these scrotal incisions, and no problems have been produced by simultaneous exploration of both testes.

Discussion.

Much has been written about the essential differential diagnosis between torsion of the testis and acute epididymo-orchitis. Various authors nurse the illusion that differentiation can be made on such vague features as difference in the degree of fever, the relief of pain when the scrotum is elevated, or the ability to detect a twist in the spermatic cord. In very early cases it is sometimes possible to untwist the cord, with relief of pain (Chambers, 1956); but when the condition has been present for some hours, exploration provides the only accurate diagnostic investigation. Operation should be carried out whenever the medical attendant is faced with a unilateral painful swelling of the tests of recent onset in a young man who fails to give good supportive evidence for a diagnosis of infection.

Once the diagnosis of torsion of the testis is entertained, operation is obligatory. Burkitt and Chambers describe manipulative reduction of the twisted testis, but freely admit that testicular atrophy may follow even successful reduction. Whilst it is true that it is possible to untwist the spermatic cord in the early case (and, indeed, if there is any undue delay in operative exploration this procedure may be desirable), operation is essential, for it is only by this means that the normal activity of the opposite testis can be safeguarded. Exception to this rule may be made in the case of the new-born infant in whom there is no anatomical abnormality. Glaser and Wallis (1954) reviewed the literature relating to this type of case and, finding that testicular atrophy always followed surgery and that bilateral torsion in this age group was extremely rare, advocated conservative measures. Their conclusions cannot be applied to the adult.

Whilst most present-day authors recognize the need for operative intervention, the desirability of bilateral simultaneous exploration is not so widely accepted. Moulder (1945) and Campbell, recognizing the risk of bilateral torsion, advocate prophylactic orchidopexy on the contralateral side, but do not make the point that this procedure can be readily carried out at the initial exploration. In 1958, Adams and Slade described a case in which symptoms occurring 12 months after removal of one testis for torsion induced them to fix the testis on the opposite side.

The present group of cases, albeit small, indicates that half these patients have a bilateral anatomical abnormality and therefore run risk of bilateral torsion with resultant sterility. Simultaneous exploration of both sides of the scrotum is such a simple procedure that it should be carried out in every case. Torsion of the retained abdominal testis (Case XII) is quite rare, although it is well recognized. Charendoff *et alii* (1951) reviewed the literature on the subject, and pointed out that 60% of all patients with torsion of an abdominal testis had an associated testicular neoplasm.

Summary.

1. A series of cases of torsion of the testis is reviewed.

2. Operative exploration provides the only sure way of differentiating this condition from unilateral epididymo-orchitis, and therefore all patients presenting with a unilateral swollen painful testis and without clear-cut evidence of infection should undergo an exploratory operation.

3. Of all patients with testicular torsion, 50% have an underlying anatomical abnormality present on both sides.

4. It therefore follows that simultaneous bilateral exploration should be carried out in all cases. The contralateral side can be easily and safely fixed by a Jaboulay procedure, and this will prevent the occurrence of bilateral testicular torson and resultant sterility.

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Reports of Cases.

A CASE OF ANÆMIA ASSOCIATED WITH MACROGLOBULINÆMIA.

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ALTHOUGH quite a number of reports of cases of macroglobulinæmia have been published since the original reports by Waldenström (1944, 1948), the nature, pathogenesis and full significance of the phenomenon remains obscure. Mackay (1956) first reported a case in Australia, and subsequently a few others have been described (Mackay, Taft and Woods, 1957; Pitney, O'Sullivan and Owen, 1958; Owen, Pitney and O'Dea, 1959). The present case is reported because of some unusual features and because of the response of the anæmia to splenectomy.

Clinical Record.

The patient, a male, aged 73 years, presented on May 26, 1958, with a history of progressive weakness over the previous six months. Examination showed him to be a thin, pale, elderly man with no obvious bruising or bleeding. The liver was not palpable, and no enlarged lymph nodes were found. The spleen was enlarged to four fingers' breadth below the left costal margin. Blood examination gave the following information: the hæmoglobin value was 6·8 grammes per 100 ml.; leucocytes numbered 6100 per cubic millimetre (neutrophils 39%, lymphocytes 51%, monocytes 9%, eosinophils 1%). The platelets numbered 240,000 per cubic millimetre, and 4% of the erythrocytes were reticulocytes; the erythrocyte sedimentation rate was 53 mm. in one hour (Wintrobe). The blood was group O, Rh-positive. Examination of a smear of peripheral blood showed slight central pallor, slight anisocytosis and poikilocytosis and some poly-

[1] In receipt of a grant from the National Health and Medical Research Council of Australia.

chromatic cells. Aspiration biopsy of sternal bone marrow revealed lymphocytosis with decreased myeloid and erythroid series (lymphocytes 61%, monocytes 2%, erythroblasts 2%, normoblasts 4%, premyelocytes 2%, myelocytes 3%, metamyelocytes 2%, band forms 8%, polymorphs 16%). The red cell fragility was normal and the Coombs test produced a negative result. No occult blood was found in the fæces, and there was no evidence of chronic blood loss. The mean red cell life was estimated to be 40 days, with the use of a Cr^{51} technique (Donohue, Motulsky, Giblett, Pirzio-Biroli, Viranuvatti and Finch, 1955).

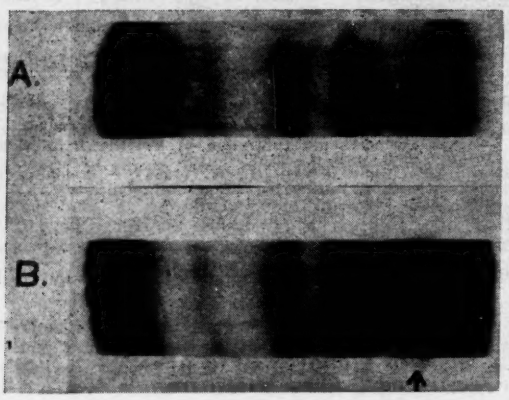

FIGURE I.
Electrophoretic patterns: A, normal serum; B, patient's serum—the arrow indicates the macroglobulin.

The patient was treated by transfusion with packed cells, and discharged from hospital on June 27 with a hæmoglobin value of 12 grammes per 100 ml. Follow-up examination in July, 1958, showed that the hæmoglobin value had fallen to a level of 9 grammes per 100 ml. The patient was then given a course of prednisone, starting with 60 mg. on the first day, 45 mg. on the second day and 30 mg. per day thereafter for 20 days (total dosage 705 mg.); but this was without any apparent effect clinically or hæmatologically, the hæmoglobin value remaining about 9 grammes per 100 ml.

By September, 1958, the hæmoglobin value had fallen to 6·8 grammes per 100 ml., and the patient was readmitted to hospital. The leucocyte count was found to be 6800 per cubic millimetre (lymphocytes 54%), polychromatic cells and occasional nucleated red cells being present in the smear. The reticulocyte proportion was 3%. An aspiration liver biopsy on September 19 showed no evidence of extramedullary erythropoiesis or hepatic parenchymal disease. There was some slight hæmosiderosis, largely confined to the Kupffer cells.

In December, 1958, the hæmoglobin value had fallen to 5·3 grammes per 100 ml.; the reticulocyte proportion was 6%, and polychromatic and nucleated red cells were present in the smear. The leucocytes numbered 8800 per cubic millimetre (lymphocytes 54%). Clinical examination of the patient at this time revealed some small firm discrete lymph nodes in both axillæ and groins, and the liver was enlarged to two fingers' breadth below the right costal margin. A small lymph node, measuring 1·5 by 1·0 by 0·3 cm., was removed from the left axilla. This showed gross erythrophagocytosis and hæmosiderosis in the sinuses, together with generalized hyperplasia of the lymphocytic cells in the medulla; but otherwise the general architecture of the node was normal. The patient was treated with a transfusion of packed cells and discharged from hospital.

In January, 1959, the hæmoglobin value had fallen to 5·8 grammes per 100 ml., and the spleen was now enlarged to below the umbilicus. The patient was readmitted to hospital for splenectomy. The leucocytes numbered 8000 per cubic millimetre (lymphocytes 65%, monocytes 3%, neutrophils 30%, eosinophils 2%), and the reticulocyte proportion was 5%. The total serum protein content was found to be 9 grammes per 100 ml.; paper electrophoresis revealed a discrete component migrating as a fast gamma globulin. No cryoglobulins were detected in the serum, the Sia water test gave a negative result, and no atypical agglutinins were discovered. No Bence Jones protein was found in the urine. The patient was given a transfusion of packed cells, and splenectomy was performed on January 28, 1959; a small piece of liver, a mesenteric lymph node and portion of the eleventh rib were also removed. His post-operative recovery was uneventful, and he was discharged from hospital on February 11 with a hæmoglobin value of 11·3 grammes per 100 ml. and a leucocyte count of 18,000 per cubic millimetre (lymphocytes 66%, monocytes 2%, neutrophils 28%, eosinophils 4%). The total serum protein content was 9·5 grammes per 100 ml., and the electrophoretic pattern appeared unaltered (Figure I). On February 19, serum was collected and submitted to ultracentrifugation (Dr. J. O'Dea, Commonwealth Serum Laboratories, Melbourne). The serum was examined at a dilution of 1 in 4 in 0·2M sodium chloride solution at 60,000 r.p.m. in a "Spinco Model E" ultracentrifuge. The pattern (Figure II) showed an abnormal component comprising about 15% of the total area with a sedimentation constant (S^{20}_w uncorrected for concentration) of 13·6 S. The true sedimentation constant—that is at zero concentration—was not computed, but would presumably have been higher.

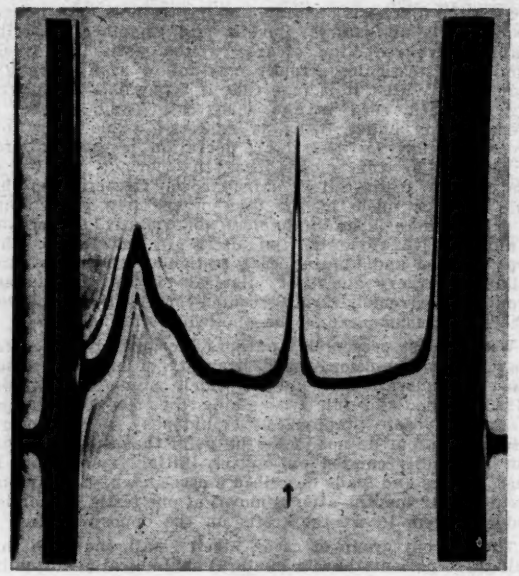

FIGURE II.
Ultracentifuge pattern: the arrow indicates the macroglobin.

At the monthly follow-up examinations the patient appears clinically well, and does not require transfusion to maintain his hæmoglobin level, which remains at 10 to 11 grammes per 100 ml. However, the leucocyte count has remained at 17,000 to 18,000 per cubic millimetre, with a marked lymphocytosis of the order of 70%. The reticulocyte count has been consistently less than 1%. The total serum protein content remains high, and the electrophoretic pattern is as before. The serum haptoglobin values (Owen, Mackay and Got, 1959) were estimated on two occasions after splenectomy. The values were between 75 and 100 mg. per 100 ml. (as hæmoglobin) on each occasion. Five months after splenectomy, the mean red-cell life was estimated by the Cr^{51} technique to be of the order of 120 days.

Histological Findings.

The spleen was grossly enlarged, weighing 2200 grammes. Examination of the cut surface showed a firm appearance with no obvious infarcts; but there were visible some small whitish spots, approximately 1 mm. in diameter, which appeared to be enlarged follicles. Examination of sections showed considerable congestion of the sinuses with gross erythrophagocytosis and hæmosiderosis, and increased numbers of plasma cells present in these areas. Some small foci of erythropoiesis were present.

In sections of the mesenteric lymph node considerable erythrophagocytosis was seen, particularly in the peripheral sinuses, together with a gross deposition of hæmosiderin. The basic architecture of the node appeared intact, but there was marked proliferation of lymphocytes in the medulla, and in some areas there was infiltration of lymphocytes through the capsule into the adjacent fatty tissue.

Examination of the marrow cavity of the rib showed cellular marrow with focal collections of lymphocytes; some of these foci also contained increased numbers of plasma cells.

The liver biopsy showed normal hepatic parenchymal cells. There was increased cellularity of the portal tracts from infiltration of lymphocytes and occasional plasma cells. There was increased hæmosiderin deposit in the Kupffer cells and in the cells of the portal tracts. In the sinuses there were many small collections of round cells and some small foci of erythropoiesis.

Discussion.

This patient presented many of the features of Waldenström's macroglobulinæmia (Waldenström, 1944). He was an elderly man with anæmia and splenomegaly, and his serum contained large amounts of a macroglobulin. However, his fundi were normal for his age, and he did not show the bleeding tendency which has been a marked feature of many patients with this syndrome (Waldenström, 1948; Long, Riopelle, Francœur, Paré, Poirier, Georgesco and Colpron, 1955; Jim and Steinkamp, 1956; Mackay *et alii*, 1957).

Peripheral blood smears have consistently shown relative lymphocytosis, and histological examinations of sections of lymph nodes, bone marrow, liver and spleen have likewise all shown an increase in lymphocytic elements. Since splenectomy, the peripheral blood has shown an increased number of lymphocytes with a tendency towards immaturity of the lymphocytic series. These findings suggest a diffuse progressive neoplasia of the reticuloendothelial system, and this would be in keeping with many other described cases of macroglobulinæmia.

Anæmia is present in most patients with macroglobulinæmia (Mackay, 1956), though the mechanism is usually obscure. Probably several factors operate. In the present case the reduced red-cell life, the increased reticulocyte level and the partial response to splenectomy suggested increased erythrocyte destruction, though the result of the Coombs test was negative. There was also histological evidence of marked erythrophagocytosis in lymph glands and spleen.

After splenectomy, the hæmoglobin level remained in the vicinity of 11 grammes per 100 ml. and the mean red cell life was in the normal range. At this time, the reticulocyte count and the serum haptoglobin level were normal; this indicated that increased erythrocyte destruction was no longer a major factor responsible for the anæmia (Nyman, Gydell and Nosslin, 1959). Marrow infiltration was found on biopsy, and inadequacy of marrow erythropoiesis was suggested by the histological evidence of extramedullary erythropoiesis. The persistence of the macroglobulinæmia suggests that in this case the macroglobulin *per se* was not responsible for increased erythrocyte destruction.

Hæmolytic anæmia in association with macroglobulinæmia has been reported by Christenson and Dacie (1957), by Fudenberg and Kunkel (1958) and by Fudenberg, Barry and Dameshek (1958). In some of these cases the macroglobulin was shown to act as an erythrocyte agglutinin. No abnormal agglutinin was detected in the serum in the case described here. In other cases of macroglobulinæmia, no evidence of increased erythrocyte breakdown was obtained (Mackay, Eriksen, Motulsky and Volwiler, 1956; Pitney, O'Sullivan and Owen, 1958).

Unlike the cases described by Pitney *et alii* (1958), by Zubrod (1959) and by Glenchur *et alii* (1958), in the present case the patient did not respond to steroid therapy. However, splenectomy affected the anæmia, but not the macroglobulinæmia. Likewise, splenectomy was found to be "of considerable benefit" in a case described by Mackay (1956), who considered that the anæmia present was hæmolytic in nature; however, the only reported evidence for hæmolysis was the finding of reticulocyte counts of 1% and 3·5% prior to splenectomy, and no details of the post-operative improvement were given.

Since it seems likely that the present case is one of reticulo-endothelial neoplasia, it is relevant that hæmolytic anæmia has often been recorded in patients with reticuloses, leukæmias or other neoplasias, who do not exhibit macroglobulinæmia (Dacie, 1954). The cause of the hæmolysis in these cases is not always clear. In some cases circulating erythrocyte auto-antibodies are demonstrable. In others, it seems that the existence of a large spleen *per se* may be responsible. Thus, Berlin (1951), studying patients with chronic leukæmia, reported that hæmolysis was more common in those with large spleens than in those with small spleens. In support of this thesis is the finding of splenomegaly, of presumably non-neoplastic origin, associated with increased hæmolysis in liver disease (Chaplin and Mollison, 1953) and in "cryptogenic" splenomegaly (MacFadzean, Todd and Tsang, 1958). Increased erythrophagocytosis, which is marked in some cases of reticulosis (Farquhar and Claireaux, 1952), is presumably a contributory factor, and may be so in the present case.

Summary.

An unusual case of anæmia associated with macroglobulinæmia is described.

Splenectomy relieved the anæmia to some extent without affecting the macroglobulinæmia. The underlying pathological condition appears to be a diffuse neoplasia of the lymphocyte system.

Acknowledgements.

We wish to thank Dr. K. W. Starr, Honorary Director of the Special Unit, for permission to publish this case; Dr. R. P. Melville for performing the splenectomy; Dr. J. O'Dea, of the Commonwealth Serum Laboratories, for arranging the ultracentrifuge analysis; Mr. G. Wilson for technical assistance; and Miss A. Kowadlo for the electrophoretic patterns illustrated in Figure I. One of us (J.A.O.) is in receipt of a grant from the National Health and Medical Research Council of Australia, to which we are indebted.

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Reviews.

Automatic Ventilation of the Lungs. By William W. Mushin, M.A., M.B., B.S., F.F.A.R.C.S., L. Rendell-Baker, M.B., B.S., F.F.A.R.C.S., and Peter W. Thomson, B.A., M.B., B.Chir., F.F.A.R.C.S.; *1959. Oxford: Blackwell* Scientific Publications. 8½" × 5½", pp. 365, with 190 illustrations. Price: 47s. 6d. (English).

IN the last decade there has been an ever-increasing application of mechanical pulmonary ventilation to anæsthetic practice and to the management of respiratory insufficiency in medical practice; also, the production of ventilators has tended to outstrip the spread of knowledge concerning their safe and effective employment. Thus the need for a work dealing with automatic ventilation of the lungs has been great, particularly in anæsthesia.

The publication under review has been produced by three practising anæsthetists and a research assistant in anæsthesia. As is indicated in the preface, it has been directed mainly to other anæsthetists. Its value and importance in this respect cannot be exaggerated. Outside the field of anæsthesia, interest in it will be restricted almost entirely to those treating patients with prolonged respiratory insufficiency.

The first two chapters deal with the physiological and clinical aspects of controlled respiration. Each is brief but succinct, and is followed by a complete list of references. Seven-eighths of the book are concerned with the automatic ventilators themselves. The general physical principles in their design and classification are discussed. This discussion provides a background for detailed lucid descriptions of over 60 ventilators, from which tank types, strangely enough, are omitted. The 190 diagrams and 190 figures are of an excellent standard. There is a useful appendix, with a classification and functional analysis of the ventilators and a list of their manufacturers. The index is large and well arranged. In all, this is a beautifully produced volume dealing principally with a very specialized aspect of artificial ventilation.

Recent Advances in Pædiatrics. *Edited by Douglas* Gairdner, M.A., D.M., F.R.C.P.; second edition; 1958. London: J. & A. Churchill, Limited. 8" × 5", pp. 388, *with 82 illustrations. Price: 48s. (English).*

As is to be expected in a "Recent Advances" volume, this edition differs very considerably from the first. The emphasis has rather moved from the clinical to the basic biological sciences, so that more than half the book is concerned with the physiology and pathology of the newborn, thyroid physiology and growth. This is all very well discussed, and all pædiatricians will find it very informative.

The subjects covered are hæmatology of infancy, jaundice of the newborn and changes in circulation at birth. Spina bifida and hydrocephalus merit two chapters, now that the surgeons are gradually lifting them from the category of the hopeless and making it more important for everyone to know more about them.

Professor Illingworth fully reviews the current literature on rheumatic fever and its treatment and prevention, emphasizing the importance of steroids in the treatment and prevention of carditis and the effectiveness of penicillin prophylaxis.

With improvement in treatment of the deaf, a chapter to bring us up to date in ætiology and diagnosis is welcome; this is written by Dr. Edith Whetnall, Ear, Nose and Throat Surgeon and Director of the Audiology Unit, Royal National Throat, Nose and Ear Hospital, London.

On the nephrotic syndrome comes a contribution from the United States of America by W. W. McCrory and D. S. Fleisher, of Philadelphia Children's Hospital. Tuberculosis and its very satisfactory control in recent years are discussed by F. J. W. Miller, of Newcastle-on-Tyne. As the staphylococcus still appears unconquered, there is an apt reminder in a chapter on osteitis.

This book will provide an excellent revision course in pædiatrics; but it is not light bedside reading.

Instrumentation in Anesthesiology. By William H. L. Dornette, M.D., and Verne L. Brechner, M.D.; 1959. Philadelphia: Lea & Febiger. *Sydney: Angus &* Robertson, Limited. 9¾" × 5¾", with 130 illustrations. Price: 88s.

APART from some intrusion of those peculiarities of idiom and construction that characterize American writings, this book provides in general a commendably brief and clear account of the great variety of electronic and other devices now available for supplementing our ordinary perceptions in the conduct of anæsthetic procedures and research. At the outset the authors emphasize the paramount need for conserving the patients' safety when these aids are employed, especially as regards the maintenance of asepsis and the prevention of anæsthetic explosions. The very first illustration shows admirably how the first consideration must be vitiated by a clutter of gear, but the easy satisfaction of the latter by the use of non-inflammable agents is not adequately stressed.

After this introduction, the four succeeding chapters give a good outline of basic electronics and the necessary recording devices, which is something of a revelation to us, whose knowledge of "electricity" is perhaps rather antiquated. Although some confusion regarding the flow of electrons and the direction of currents is now evident, such mysteries as shroud the operation of vacuum tubes and the cathode-ray oscilloscope, for example, are largely dispelled, while the working of indicating and recording appliances is adequately explained. In Figure 22, however, a mutual substitution of either the diagrams or their appended legends would appear to be required in order to correct a discrepancy with the relevant text on the preceding page. Further, on page 37, the term "induction coil" appears where "inductance coil" (or choke) is meant.

An excellent chapter on electrocardiography follows, in which the principles and procedure are well outlined, and the interpretation of the resulting visual or written tracings is satisfactorily explained. Auditory ("audial") and electrical cardiac monitoring next receive attention, an interesting feature of this section being the œsophageal stethoscope, by means of which one can listen to (i.e., monitor) the heart sounds through a modified cuffed tube located in the gullet. Discussions of cardiotachometry and phonocardiography follow, covering the use of electrical aids in procuring visual or graphic representations of the heart rate and sounds. Most of us would be satisfied with tactile and auditory impressions in this connexion.

Electroencephalography is next dealt with in rather superficial yet informative fashion, and with some emphasis on its possible utility in the detection of "cortical insults" occasioned by hypoxia, hypercarbia or deep narcosis. This applicability is expanded towards the end of the book in the description of "servoanesthetizers", by means of which electrical impulses from the brain may be employed to regulate automatically the depth of anæsthesia.

Thermometry, manometry and "flowmometry" now receive detailed and most interesting consideration, especially with regard to the use of sensitive electrical devices to amplify the minute physical changes, both within the body and in anæsthetic apparatus, to which these procedures might be applicable. Here the thermocouple is described fully and with reference to factors, especially of location, that could affect its accuracy, as in induced hypothermia. A most ingenious device, the strain-gauge transducer, is now dealt with in some detail. Its operation depends on minute variations in the thickness and length of a series of fine conductors in response to small pressure changes in the

apparatus being tested. Thus varying resistances will be opposed to the passage of electrical impulses through these conductors; but this resistance will certainly not be decreased, as is stated on page 36, when any such conductor is stretched—it will be increased, since the cross-sectional area of the conductor is thereby reduced. As for flowmometry, this neologism covers a large variety of applications, including estimations of tidal and minute volumes, as well as the vapour tensions of respired atmospheres.

Apart from a valuable chapter on oximetry, in which the principles and operation of an ear-oximeter are described in detail, the remainder of the book is largely concerned, perhaps too exhaustively, with the analysis of the carbon-dioxide and oxygen contents of blood and of gaseous mixtures. While the estimating of carbon dioxide by infra-red absorption and that of oxygen by virtue of its paramagnetic property is a fascinating story, the detailed account of laboratory procedures now included makes one inclined to accept the invitation of the authors to "skip-over" these pages.

The book is well produced on good quality paper, but there are rather too many printer's and allied errors. It winds up with some comments on central monitoring systems, some hints regarding kit, and a few useful conclusions, the best being that the "monitor" should never be a nuisance. The index could be enlarged with benefit, while the addition of a small glossary would be very helpful to many readers. Taken all round, the work is a most valuable addition to medical literature, and should be very instructive to research-minded anæsthetists.

Official Year Book of Queensland, 1958. No. 19, 1959. Issued under instructions from The Right Honorable the Treasurer, by S. R. Carver; compiled by S. E. Solomon. Brisbane: S. G. Reid, Government Printer. 8½" x 5½", pp. 464, with charts and illustrations. Price not stated.

THE chapters in this year book of most interest to medical readers will be those on population and health. We may note a few points of interest. Even with the recent high migration figures, 88% of the Queensland population is Australian born. Mortality in tropical Queensland differs little from that in sub-tropical Queensland, except that the infant mortality is often a few units higher per thousand births. The number of full-blooded aborigines recorded has shown an increase recently. The format and production of this year book are excellent.

Pathology of Tumours of the Nervous System. By Dorothy S. Russell, Sc.D., M.A., M.D., F.R.C.P., LL.D., and L. J. Rubinstein, M.D.; 1959. London: Edward Arnold (Publishers) Limited. 9¾" x 7", pp. 328, with 280 illustrations. Price: 70s. (English).

THIS volume is the companion to "Neuropathology", edited by the late Dr. J. G. Greenfield, and just as that work is now the standard work on non-neoplastic diseases of the nervous system, so should this book become the standard work on tumours of the nervous system. There has been no satisfactory book in the English language till now, and we are fortunate that one so able and experienced as Professor Dorothy Russell should find time to devote to remedying this defect.

The tumours treated here include those of the peripheral in addition to those of the central nervous system. There is a chapter on tissue culture in relation to cerebral tumours by C. E. Lumsden, in which he indicates its value in diagnosis and classification as well in the study of cell behaviour.

This book can be unreservedly recommended to all who are interested in neuropathology. The material is up to date and well presented. The illustrations are excellent, and one has no difficulty in recognizing the tissues and cells which they demonstrate.

Rehabilitation of the Hand. By C. B. Wynn Parry, M.B.E., M.A., D.M., D.Phys.Med., assisted by N. R. Smythe, M.A.O.T., and L. E. Baker, M.C.S.P.; 1958. London: Butterworth and Company (Publishers), Limited. 9¾" x 6¾", pp. 292, with 101 illustrations. Price: 62s. 6d. (English).

DURING the past decade a number of excellent books concerning the hand have been published. Naturally, each has borne the influence of the author's special interest, and so it is with the present book under review. The vast experience of the author, gained during and after the recent war, has led to the detailed setting down of the conservative management and after care of the hand injury and disease. This book is well presented in both text and illustration, bearing as it does the mark of authenticity.

Consideration of peripheral nerve injury and all facets of its management has received especial care, and particularly appreciated are the techniques of examination and recording the findings of these examinations. This work encompasses a wider field than that of pure hand malady, giving thought to the treatment of the arthritides and the management of upper limb weakness. Its greatest virtue lies in the details of technique of physiotherapy and of occupational and remedial care, together with the problems of rehabilitation of the person who has sustained hand injury. The surgeon, the therapist and all those responsible for settlement of these subjects will find this an invaluable reference book. Certainly it justifies the author's attempt to provide the many answers to what he chooses to call "the usual way" in rehabilitation of the hand.

Group Psychotherapy Theory and Practice. By J. W. Klapman, M.D.; second edition; 1959. New York and London: Grune and Stratton, Inc. 6" x 9", pp. 300. Price: $6.75.

IN recent years, much study has been made of the behaviour of people when they are in groups, and of their relationship to each other in this situation. This has led to the enthusiastic advocation of the use of groups in the treatment of psychological disorders. The present book discusses this aspect of psychological treatment. An initial chapter on the historical background is followed by a consideration of the implications, largely theoretical, of individual psychotherapy in a group structure. The application of techniques of group methods to persons with various grades of personality disorder and in private practice is outlined. A short chapter on the assessment of the results of group psychotherapy emphasizes the difficulties in evaluating this method of treatment.

After reading this book, one wonders whether the cloak of group psychotherapy covers more than the old-established procedures of education of the patient and assisting him to become part of his normal social structure.

Transplantation of Tissues: Skin, Cornea, Fat, Nerves, Teeth, Blood Vessels, Endocrine Glands, Organs, Peritoneum, Cancer Cells. Edited by Lyndon A. Peer, M.D., with twelve contributors; Volume 2; 1959. Baltimore: The Williams and Wilkins Company. Sydney: Angus & Robertson, Limited. 10" x 6¼", pp. 704, with 252 illustrations. Price: £11.

THIS volume is, of course, complementary to the first which appeared under the same editorship in 1955. It is, however, complete in itself, and many will find it a much more valuable publication than its predecessor. It has the great merit of coming on the scene at a time when the problems of tissue transplantation are being tackled with vigour and enthusiasm in centres all over the world. Much of the work presently being done is of a fundamental character, and engages the attention of workers in a variety of scientific disciplines. The editor has, for this reason and with great wisdom, drawn together a strong team of contributors representing specialists in widely differing fields of biological research from both sides of the Atlantic.

It is appropriate that consideration should first be given to the transplantation of skin, for this is the tissue which has been studied most closely. The opening chapter by Dr. Peer himself sets the pattern for the whole book—and it forms an admirable introduction to the one that follows on the "Zoologic Laws of Transplantation", by Professor Medawar. Any surgeon intent on learning something of the general problems of homografting, of the methods of modifying the homograft reaction, of "enhancement" of actively acquired tolerance and of the significance of a difficult and new vocabulary, would do well to direct his attention here. He can then proceed with confidence and a measure of understanding to the practical problems that follow.

By this opening section alone, the book has more than justified itself. Transplantation of the cornea is dull in comparison, and fat is intriguing only because it has the knack of retaining in its new home the specific regional qualities it acquired at its donor site. True to its antecedents, it waxes and wanes in sympathy with its earlier neighbours. When we come to nerve grafting, our interest is again excited as we contemplate the opportunity in reparative surgery when homografting becomes a feasible proposition.

The section on the transplantation of blood vessels has been contributed by Ralph Deterling. The recipe here is as before. The practising surgeon intent on finding technical details will find nothing to help him in his operations; but if he hopes to gain a proper understanding of the problems which vascular grafting has posed and of the steps in their solution, he will do well to read this section from

beginning to end. It presents, in fact, an exhaustive review of the subject, and as a measure of the completeness of its coverage there is a bibliography of very nearly 600 references to choose from.

We can read with interest and disappointment of the transplantation of endocrine glands, in the evaluation of which, both in clinical and in laboratory experiment, there has been so much faulty interpretation. There seems, however, to be some hope of ultimate success. The same is true of homotransplantation of the kidney. This may well become a more profitable excersise, and, for this reason, an intensive study has already been made of its behaviour as an autograft and as a homograft. The entire subject from every angle has been dealt with most admirably by David Hume, of the Medical College of Virginia.

It is difficult for us to do justice to such a volume; a critical review of its text would properly engage the attention of a whole panel of experts. It is inevitable, in such a rapidly growing field of knowledge, that so much of what is written today will be out of date tomorrow, and such considerations may well deter the individual from handing his money across the counter. Any worthwhile medical library will, however, for the very same reason be obliged to add this book to its lending list. It will satisfy the general reader intent on self-indoctrination into the problems of tissue transplantation, for all the answers are here and easy enough to find so long as he reads with proper discrimination. Equally, it will please the expert, for he is certain to find it a dependable work of reference.

Heavy Metals and the Brain. By John N. Cumings, M.D., F.R.C.P.; 1959. Oxford: Blackwell Scientific Publications. 8¾" × 5½", pp. 172, with 9 tables and 4 illustrations. Price: 32s. 6d. (English).

This is a small book of pleasant format written by one of the foremost experts on the subject, John N. Cumings, Professor of Chemical Pathology in the University of London at the Institute of Neurology. He will be remembered by many as a scientific worker of the greatest integrity in the pathological laboratory of the late Dr. J. G. Greenfield at the National Hospital, Queen Square.

The sections dealing with each metal begin appropriately with historical notes, which give perspective to all that follows. He writes:

> Some of the chemical properties of quicksilver have been known for many thousands of years, for records are available indicating some knowledge in Egypt in 1600 B.C. and in India in 500 B.C., where metallic salts of mercury were apparently used therapeutically.

In the case of mercury, such enticing terms as "miner's trembles", "hatter's shakes" and "fulminate itch" show the intimate relationship between occupation and poisoning. Again, in connexion with lead, he writes:

> Nycander in the first century B.C., in a volume on poisons, makes mention of litharge and the symptoms of intoxication following its use, but even earlier, Hippocrates (370 B.C.) was said to have recognized colic in a lead worker.

The opening paragraph of the book reads:

> Toxic signs of excessive copper intake have been known for a number of centuries, in fact Thomas Percival in 1785 described the intestinal lesions associated with the consumption of pickled samphire containing large amounts of copper which led to the death of the seventeen year old girl ten days later.

So pickled samphire leads to one of the most recent advances in knowledge of chemical pathology, with which Professor Cumings has been so intimately connected. Thus more than half the book deals with hepato-lenticular degeneration.

There is a notable collection of chemical data in connexion with lead, but otherwise the writer is not on such sure personal ground when he deals with mercury and lead intoxication, the presentation being, of necessity, more clinical. Such statements as "Epileptic-like attacks are frequently mentioned, by many writers, mainly in those patients showing convulsions", and later reference to "epileptiform seizure", might be clarified in terms of clinical thought.

The text is very easy to read. The presentation has that clarity and succinctness which characterize good writing. It is deceptively simple, for 880 references have been culled by the author. We are left with the regret that the book dealt only with the effects of copper, mercury and lead on the central nervous system. However, in this, it is true to the author's intention, rather than being a compendium of the toxic effects of metals.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"The Anti-Glubulin (Coombs) Test in Laboratory Practice", by I. Dunsford, Ph.D., M.I.Biol., and Jean Grant, F.R.C.P.; 1959. Edinburgh and London: Oliver and Boyd, Publishers. Adelaide: Rigby Limited. 8¾" × 5½", pp. 132, with illustrations. Price: 21s. 9d.

"The Pane of Glass", by John Bartlow Martin; 1959. London: Victor Gollancz, Limited. 8¼" × 5¼", pp. 412. Price: 30s. (English).

"The Chemistry of Heredity", by Stephen Zamenhof, Ph.D.; 1959. Oxford: Blackwell Scientific Publications. 8¾" × 5¾", pp. 106, with 10 figures and 7 tables. Price: 34s. (English).

"Cancer of the Breast", compiled and edited by Willard H. Parsons, M.D., F.A.C.S., with a Foreword by Warren H. Cole, M.D., F.A.C.S.; 1959. Oxford: Blackwell Scientific Publications. 9" × 6", pp. 247, with many illustrations. Price: 60s. (English).

"Recent Advances in Surgery", edited by Selwyn Taylor, D.M., M.Ch., F.R.C.S., with a Foreword by Sir James Paterson Ross, K.C.V.O., M.S.; fifth edition; 1959. London: J. & A. Churchill Limited. 8" × 5¼", pp. 514, with 160 illustrations. Price: 60s. (English).

"Diagnosis and Treatment of Tumors of the Chest", sponsored by the American College of Chest Physicians; 1960. New York, London: Grune & Stratton, Inc. 10" × 6¾", pp. 384, with illustrations. Price: $14.75.

"The Essentials of Perimetry", by H. Reed, M.B., B.S. (London), F.R.C.S. (England), F.R.C.S. (C), F.A.C.S.; 1960. London, New York, Toronto: Oxford University Press. 9¾" × 7", pp. 204, with many illustrations. Price: 64s. 9d.

"La Colelitiasi et Alia Hepatologica", Atti del Primo Symposium Internazionale di Epatologia; 1959. Edizioni Chianciano. 9¾" × 6¾", pp. 638, with illustrations. Price not stated.

"The Ætiology and Arrest of Pre-Eclamptic Toxæmia: With Early Ambulant Treatment", by K. Douglas Salzmann, M.D., M.R.C.P. (Edinburgh), D. Obst., R.C.O.G.; 1960. London: H. K. Lewis and Co. Limited. 8¾" × 5¼", pp. 78. Price: 10s. 6d.

"Brucella Infection and Undulant Fever in Man", by Sir Weldon Dalrymple-Champneys, Bt., C.B., D.M., D.P.H., F.R.C.P.; 1960. London, New York, Toronto: Oxford University Press 8¼" × 5¼", pp. 210, with illustrations. Price not stated.

"The Surgery of Theodoric ca. A.D. 1267", translated from the Latin by E. Campbell, M.D., and James Colton, M.A.; Volume 2, Books 3 and 4; 1960. New York: Appleton-Century Crofts, Incorporated. 8¼" × 5¼", pp. 254, with two illustrations. Price not stated.

"Studies of the Effect of Diethylstilbestrol on the Plasma Lipids and Thyroid Function: An Experimental Investigation on 20 Male Patients who have Recovered from Coronary Occlusion", by S. E. Jensen; 1959. Acta Medica Scandinavica Supplementum 346. Stockholm: Acta Medica Scandinavica. 9¼" × 6¾", pp. 118, with illustrations. Price not stated.

"The Anatomy of Judgment: An Investigation into the Processes of Perception and Reasoning", by M. L. Johnson Abercrombie, B.Sc., Ph.D.; 1960. London: Hutchinson & Co. (Publishers) Ltd. 8¼" × 5¼", pp. 156, with illustrations. Price: 37s. 3d.

"Miscellaneous Notes (Fifth Series)", by F. Parkes Weber, M.D., F.R.C.P., F.S.A.; 1960. London: H. K. Lewis & Co. Ltd. 7¼" × 4¾", pp. 24. Price not stated.

"Outline or Orthopædics", by J. C. Adams, M.D. (London), F.R.C.S. (England); third edition; 1960. Edinburgh, London: E. & S. Livingstone Ltd. 8¾" × 5¼", pp. 448, with many illustrations. Price: 35s. (English).

"Surgical Note-Taking: A Booklet for Surgical Dressers and Clerks Commencing Clinical Studies", by C. F. M. Saint, C.B.E., M.D., M.S., F.R.C.S. (England), F.R.A.C.S., and J. H. Louw, Ch.M.; fifth edition; 1960. London: H. K. Lewis & Co. Ltd. 7¼" × 5¾", pp. 180. Price: 12s. 6d. (English).

"Requirements for Biological Substances: 1. General Requirements for Manufacturing Establishments and Control Laboratories. 2. Requirements for Poliomyelitis Vaccine (Inactivated)"; Report of a Study Group; World Health Organization Technical Report Series Number 178; 1959. Geneva: World Health Organization. 9¼" × 6¼", pp. 32. Price: 1s. 9d. (English).

The Medical Journal of Australia

SATURDAY, APRIL 23, 1960.

BLOOD TRANSFUSION AND THE PATIENT'S CONSENT.

BLOOD TRANSFUSION is a commonplace of medical practice. In addition to its long-established use for replacement of blood lost as a result of trauma, it is a common accompaniment of surgical operation and is indicated in the management of various surgical and medical conditions. Notably, perfection of the technique of exchange transfusion has saved the lives of many infants who otherwise would certainly have died from hæmolytic disease of the newborn. Indeed, so effective is it in many situations, and so fully has it been accepted by both doctors and patients, that failure to use it where indicated would be generally considered culpable negligence on the part of the doctor. The patient, of course, if he is responsible, has the normal right to refuse it or any other form of treatment. The doctor, having explained the position and used such persuasion as he may have thought appropriate, can do no more about it. He certainly cannot force treatment on a patient who refuses it. His only real dilemma here arises when other associated treatment has to be considered. An example is reported by William T. Fitts, Junior, and Marshall J. Orloff,[1] who were treating a man with a large cancer of the transverse colon. He had bled severely and was advised that it would be very dangerous to undergo a major surgical procedure without blood transfusion. He said that, as he was a member of the society known as Jehovah's Witnesses, accepting the blood transfusion would violate an important religious doctrine. He would submit to any surgical operation considered necessary but not to blood transfusion. After reflection, Fitts and Orloff decided to take the risk and perform the operation without the transfusion. The patient survived the operation and convalescence, despite severe hæmorrhage during the latter, for which again he refused transfusion. The surgeons were criticized by some of their colleagues for their decision and supported by others. However, their view was that to deny surgical treatment because the patient refused blood transfusion would be just taking the easy way out. They respected the patient's convictions and still did their best for him. Because of the interest in the problem a panel of experts was asked to discuss the problem, and those who are interested in a fuller consideration of this question, including the beliefs on which the Jehovah's Witnesses base their attitude, will find the published record of the discussion illuminating. However, most people will at least agree that an adult patient has the right to accept or reject treatment. The medical attendant's attitude to further or alternative treatment will then be a matter for his own conscience.

The situation is more difficult where a child is involved. In various places throughout the world in the last few years the problem has arisen in which a parent, because of religious beliefs, has refused to allow a blood transfusion to be given to a child. Two instances were mentioned in a report from Canada some time ago.[2] The parents of an infant in a Toronto hospital refused consent for a blood transfusion which it was considered would save the child's life, and a court convened in the hospital on orders of the Ontario Attorney-General ruled that the infant be made a ward of the Children's Aid Society, which in turn gave permission for the transfusion. The report mentioned an earlier case in Manitoba in which the parents had refused to allow a blood transfusion for a boy who had accidentally been shot. The Manitoba Attorney-General found a provision in the *Child Welfare Act* of the Province which made it an offence for the parents to fail to provide medical care. Subsequently the boy was placed in the custody of a juvenile court, and the Manitoba Government applied for custody. During an adjournment obtained by the lawyers representing the parents, the child died, and at the inquest medical authorities gave evidence that if the transfusion had taken place when it was first necessary, the boy would, at the worst, have lost a leg. We have no knowledge whether action was taken against the parents in either case. An instance was also reported recently in the Sydney Press[3], in which a five-day-old boy died in Sheffield, England, after his parents had refused, on religious grounds, to let him have a blood transfusion. The Sheffield Regional Hospital Board was stated to have approved a plan for setting up certified courts in such cases, so that the child could be taken into custody of the court, which would then be asked to permit the operation. If it did so, the surgeon would be protected.

Similar incidents have occurred in Australia, and steps have been taken in at least two States to make special legislative provision to cover the problem. A Bill at present before the New South Wales Parliament is designed, in the words of the Minister for Health,[4] "to protect medical practitioners who give blood transfusions to minors in cases of emergency and as a life-saving measure when parental consent cannot be obtained or has been refused". This measure is linked up with a provision to enable minors to be immunized against certain infectious diseases when the authority or medical practitioner undertaking such immunization has been unable to locate the parents or guardians of such minors and obtain their consent for the immunization. This other provision is important but less controversial and need not detain us now. The provisions of the Bill relating to blood transfusion for minors are that transfusions "may be performed without parental or other

[1] *Surg. Gynec. Obstet.*, 1959, 108: 502 (April).

[2] *The Times*, December 15, 1958.
[3] *Sun-Herald*, March 20, 1960.
[4] *Hansard*, March 17, 1960.

legal consent if first, the doctor concerned and at least one other doctor have agreed upon the condition from which the minor is suffering, that such operation is a reasonable and proper one to be performed for such condition and that such operation is essential to save the life of such minor; secondly, the doctor who performs the transfusion has had previous experience in performing that procedure and before commencing the transfusion he has assured himself that the blood to be transfused is compatible with that of the patient". The Minister for Health stated that the effect of the Bill was that doctors, nurses and others participating in such an operation were in exactly the same position from a legal point of view, as they would be when the consent of the parent had been obtained. They would not, however, be absolved from liability for negligence or unskilful treatment. The Minister explained subsequently[8] that a Bill passed by the Queensland Parliament in December, 1959, was practically on the same lines as the New South Wales measure with one minor exception providing for the situation—for example, in the country—when only a single doctor might be available. He also said that he had received information that a measure to be introduced into the English Parliament would be on the same lines as the New South Wales Bill. We understand that something similar is now contemplated in Victoria.

Whether or not these measures are the most satisfactory way of dealing with the situation from the doctor's point of view is a matter of opinion. They may indeed be readily criticized. In particular, many doctors will feel that they have had a responsibility thrust upon them, albeit with legal protection, which more properly belongs to a court or other legal authority. The objection to the legal proceeding is that it may well hold up action in an urgent situation, and it must be agreed that previous experience gives substance to this view. In any case, this is how the law stands in Queensland and presumably will stand in the very near future in New South Wales, and it will remain to be seen how it works in practical experience. It does provide for the giving of suitable medical treatment to a child in hospital, but it does not in any way prevent a parent from removing the child from medical care. To this extent, it preserves the rights of the parents and leaves open the more difficult question of the parents' responsibility if the child dies or suffers adversely because of lack of treatment. This is not a simple problem. Few people would think of disputing the need to intervene when a child suffers because of the carelessness, indifference or frank hostility of the parent, but in the present instance none of these elements may be present. The parent, convinced on religious grounds that a blood transfusion would be a spiritual disaster for the child, acts sincerely according to his lights, and our disagreement with his view, no matter how strong it may be, provides no grounds for impugning his concern for the child's best interests. The doctor desires the best for the child, the parent desires the best for the child, but their attitudes are incompatible and the child dies. This is of course the pattern of classical tragedy, and that fact in itself should be enough to warn us not to expect an easier resolution of the dilemma.

[8] *Hansard*, March 22, 1960.

Current Comment.

THE ORIGIN OF WEEPING IN MAN.

IT is a curious fact that man is the only animal that weeps, the only creature that sheds tears when emotionally distressed. Other animals have lachrymal glands and the necessary lachrymal and orbicular muscles, but they do not weep. Has weeping any adaptively valuable function in addition to protecting the engorged eye? A. Montagu[1] believes that it has. Human infants cry, but do not usually shed tears until they are about six weeks old. Weeping then would appear to be a late development in man. What combination of factors may have led to the development of this trait in early man? The length of the dependency period of the human child suggests itself; the infant has to depend on crying to draw attention to himself when he is in distress. Another factor is the nasal mucosa. Even a short session of tearless crying, in a young infant, has a drying effect on the nasal mucosa, and in adults excessive exchange of air will quickly dry the membrane. The glands of the nasal mucosa secrete fluid which keeps the membrane moist, unless there is too much intake and output of air, and the membrane has extraordinary bactericidal and bacteriostatic efficiency when moist. The cells of the nasal mucosa have to withstand more insults than any other cells—hot air, cold air, dry air, moist air, dust and microorganisms. If it is dried with a jet of air, the mucous membrane can be inactivated within a few minutes; cells rapidly die, and bacteria can flourish on the mucus.

The hypothesis proposed is that "in man weeping established itself as an adaptive trait of considerable value in that it served to counteract the effects of more or less prolonged tearless crying upon the nasal mucosa of the infant. Infants who cried for prolonged periods of time during the early years of their lives without benefit of tears would stand less chance of surviving than those who cried with tears". Crying with tears has another useful result as well as keeping the nasal mucosa moist, for tears contain a highly bactericidal enzyme lysozyme, which also inactivates many viruses. It is suggested that in the early development of man those individuals were naturally selected in the struggle for existence who were able to produce an abundant flow of tears when they cried, because they resisted infection better than those who did not weep.

GLASS DUST.

FOR a very long time it has been a common belief that the ingestion of powdered glass mixed with food has lethal effects. Newspapers and novel writers have often suggested that powdered glass may be used for homicidal attempts. There has, up till recently, been no adequate study of the effects of introduction of powdered glass into the body by any route, but the increasing use of powdered or flaked glass of varying degrees of fineness in industry, as in the making of fibre glass, has made it necessary that such a study should be undertaken. This has been done by P. Gross, M. L. Westrick and J. McNerney.[2]

The glass used in this investigation was prepared from flakes of glass approximately 5μ thick. This was milled to a very fine dust. A coarse dust was also used. The investigation was composed of three parts: (i) eye irritation study, (ii) ingestion study, (iii) pulmonary study. White rats and rabbits were used for the studies. In the eye irritation study the lids were lifted and the ocular conjunctiva was thoroughly dusted with the finely milled dust. The glass particles were effectively

[1] *Science*, 1959, 130: 1572 (December 4).
[2] *A.M.A. Arch. industr. Hlth*, 1960, 22: 10 (January).

removed by blinking, and no corneal defects could be found. In the ingestion study one lot of rats was given the normal basal diet mixed with 10% of fine glass powder. A second lot was given food mixed with 50% of fine glass powder. Controls were used. The animals were kept on these diets for a full year, then killed and thoroughly examined. Growth curves were given in all cases. There was no appreciable difference between the control groups and those receiving glass in their diet as judged by general appearance, behaviour, growth and survival. All the rats on the 50% glass diet survived for the twelve months. No significant abnormalities were found in the intestinal tract and other organs in the glass-fed rats. In the pulmonary studies powdered glass was administered by intratracheal injection and by inhalation exposure with glass dust in the air inspired. The amount of dust in the air was vastly greater than it would be in factory air. Grossly no significant changes were noted after twelve months' exposure. Microscopically small collections of glass particles were seen widely scattered in the lungs, but there was no collagen-formation which could be attributed to the glass dust. In the intratracheal injection experiments coarse glass dust was used. Again there were no significant changes in the lungs except clusters of glass particles with proliferation of alveolar lining cells. These results were in marked contrast to those found in simultaneous experiments in which quartz dust and kaolin dust were used; in these marked changes took place in the lungs. The lack of irritating qualities to skin or mucous membranes is probably due to insolubility of the glass, and hence its biological inertness, and to the flat surface of the dust flocculi which would tend to orientate themselves parallel to the surfaces, so that sharp edges are given little opportunity to do damage. Powdered glass could be presented to an individual in the food only if it were ground very fine, and these experiments demonstrate that in this state it is inert and can produce no traumatic effects. Glass particles of a size capable of producing trauma could be unwittingly ingested with food only by a person who swallowed food without chewing it or who had lost the ability to sense the presence of foreign non-food material in his mouth. Conditions are similar in the inhalation of glass dust. Unless very finely divided it will settle out of the air too quickly to reach the lungs in appreciable amount. Glass dust then is not a serious industrial hazard, and the fiction writer can no longer give ground glass for homicidal purposes.

SAFETY OF ELECTRICAL EQUIPMENT.

It was recently brought to the notice of the Victorian Branch of the B.M.A. by a person qualified to express an opinion that some items of electrical equipment used in medical practice were considered to be potentially dangerous. At the same time there was no control over the sale of such equipment, nor were vendors obliged to seek the approval of the State Electricity Commission before marketing their products. Impressed by that opinion, the Branch Council arranged a meeting between representatives of the Branch and the Chief Electrical Inspector for Victoria and members of his staff. As a result of that meeting it is learned that the Commission has power by regulation to "prescribe" certain articles, and a prescribed article cannot be marketed unless it is approved and conforms with certain specifications. There are, however, many items of electrical equipment not governed by regulation, but the Commission is willing to examine these when voluntarily submitted and indicate to the manufacturer, wholesaler or retailer, whether or not there is objection to their sale.

In discussion, the officers of the Commission have stressed the following points: (i) No electrical equipment is safer than the flex or plug connecting it to the source of supply, and as safe plugs are now available (the sale of unsafe plugs being prohibited) all unsafe plugs should be replaced and flex wires inspected regularly and replaced if worn. (ii) Equipment made on the Continent may be unsafe, as in Continental plugs a red earth wire is used, whereas in Australia the earth wire is green. (iii) To add to the safety of electrical equipment, after it is switched off the plug should be pulled out from the source of supply. The safety officers stress particularly the dangers of head lamps connected either direct to the mains or through inadequate transformers.

As the result of the discussions it has been recommended to members of the Victorian Branch of the B.M.A. that they refuse to buy any portable medical electrical equipment unless the vendor produces evidence that the equipment has been accepted by the State Electricity Commission as suitable for use. An officer of the local supply authority will, on request, inspect fixed equipment and indicate its safety or otherwise. This is a wise and constructive move on the part of the Victorian Branch. In the light of its experience other Branches might be interested to do something similar.

IS THE FLUID REALLY FREE?

It is not easy to realize that the concept of tissue spaces containing free fluid is little more than fifty years old. Rudolph Virchow[1] had laid down the doctrine of specificity of cells: each one of a myriad of "cell-territories" was presided over by a cell which actively controlled the exchange of fluid in the area. Virchow did not mention tissue spaces, and he disagreed emphatically with the suggestion that "the action of the vessels" could play a significant part.[2] When E. H. Starling[3] suggested the idea of autonomous tissue fluid it was readily accepted because it fitted in with the latest discoveries about osmosis. The dissolved substances were presumed to be in simple solution; the capillary and cell walls were inert, and many biological processes were passive.

These ideas were not readily accepted by all anatomists. E. R. Clark and E. L. Clark[4] alleged that the tissue spaces were artefacts because they could not be found in the living rabit's ear; the intercellular substance was gelatinous. Clark and Clark could not find any holes in the lymphatic capillaries except after injury, and these healed quickly. They wrote:

> The results of direct microscopic observation of lymphatic capillaries in the connective tissues as viewed through a transparent double-walled window introduced in the living mammal show the presence normally of intact membranes lining both blood and lymphatic vessels and separating their fluid contents from the tissues outside, and the absence under normal conditions of free fluid in the tissue spaces.

At the Fourth Conference on Connective Tissues B. W. Zweifach[5] called "tissue fluid" a misnomer for what was really a gel; and M. Gaudino[6] said that, though water comprised 70% of the body, all of it was bound. Gaudino could find no microscopical evidence of tissue spaces. More recently I Gersh and H. R. Catchpole[7] have stated that the results of their anatomical studies with the electron microscope have contradicted many biochemical and physiological tenets. There are no spaces, they say, and there is no fluid which represents a dialysate of blood. "It is the ground substance as a whole which contributes the cellular environment and controls the homeostatic conditions of cells by virtue of being normally always in equilibrium with blood plasma."

[1] "Cellular Pathology", 1860, translated by F. Chance, New Sydenham Soc., London: 41.
[2] *Ibid.*: 84.
[3] "The Fluids of the Body", 1909, Constable, London.
[4] *Amer. J. Anat.*, 1933, 52: 273 (March).
[5] "Transactions of Fourth Conference on Connective Tissues", 1954, Macy, New York: 38.
[6] *Ibid.*: 78.
[7] "Perspectives in Biology and Medicine", 1960, 3: 282 (Winter).

Abstracts from Medical Literature.

HYGIENE.

Iodine for the Disinfection of Swimming-Pool Water.

A. P. Black *et alii* (*Amer. J. publ. Hlth*, August, 1959) investigated the efficiency of iodine as a disinfecting agent for swimming-pool water, because of the claim that disadvantages associated with the use of chlorine are not present when iodine is used for this purpose. Eight pools, varying from Olympic standards to small home type size, and with bathing loads varying from 1700 to three persons per day, were investigated. From the results of their investigations, the authors arrived at the following conclusions. Iodine was effective in the disinfection of water in the swimming pools treated, and in many cases superior to chlorine. Iodine residuals were less dependent on the bathing load than were chlorine residuals, because iodine is not affected by ammonia introduced by bathers. A daily dosage of one part of iodine per 1,000,000 parts of water for home pools and two parts per 1,000,000 for large public pools would be adequate under most conditions. Approximately 0·2 p.p.m. of residual iodine should be sufficient to provide water of satisfactory quality. No odours or tastes or irritation of the eyes of bathers were produced by the iodine residuals employed during the course of these studies. No visible growths of algæ were noted during the testing period. When iodine was uniformly distributed throughout the swimming pool, either through the recirculation system or otherwise, no brown iodine colour was observed, the over-all effect being the production of a pleasing aquamarine green colour in the swimming-pool water.

Meeting the Challenge of Feeding the World.

W. Anderson *et alii* (*Amer. J. publ. Hlth*, October, 1959) have collected facts which suggest that half of the world's population still subsists on diets inadequate for good health. Present statistics indicate that in recent years the world's population has been increasing at a rate of about 1·6% *per annum* while the world's food production has increased at an average annual rate of about 2%. However, as a result of improved sanitation and health education, population increases have been greatest in less advanced countries, while greatest increases in food production have occurred in technically advanced countries and economic difficulties have arisen in the uniform distribution of excess food. In less developed countries the majority of people live largely on diets of cereals and root crops. The authors suggest that the solution of these problems is uniform distribution of surpluses and the development and improvement of local agricultural methods, particularly with a view to the production of foods with a high protein content. In addition, the purchasing power of the populations in question should be increased by expansion of non-agricultural enterprises. Ways adopted by individual countries and various international organizations to improve food supplies are then referred to, but the authors consider that, although large sums are being spent on technical programmes by the countries individually or through international agencies, the food problems of the underdeveloped areas have not yet been solved.

Health and Safety in Handling the Newer Metals.

W. Harris (*Amer. J. publ. Hlth*, October, 1959) refers to a metallurgical technique which has led to the production of many of the new metals in the pure state from chlorides or fluorides of the metals concerned. These include uranium, thorium, beryllium, titanium, zirconium and plutonium. Health hazards associated with these are then discussed. Uranium and thorium are pyrophoric and dust clouds of these metals will ignite at room temperature and 270° C. respectively. Ignition of uranium results in quiescent conversion to oxide fume which consists of extremely fine particles that readily become and remain air-borne. This leads to difficulty in keeping the concentration of uranium in air below the recognized maximum allowable concentration of 80μg. per cubic metre. Thorium powder has been known to ignite with explosive violence. Other hazards associated with thorium are for practical purposes regarded as similar to those of uranium. Zirconium and titanium are usually considered relatively harmless; but recently it has been shown that zirconium possesses an unexpected instability under certain not well-defined circumstances, especially when in powder form. Beryllium is extremely toxic and a relatively small proportion of the population appears to be susceptible to extremely small concentrations, but it has little or no fire or explosion hazard. Its physical properties are such that it is usually handled in the powder form. The powder is light, fluffy, and readily dispersed into the air, and extreme measures are necessary to keep the concentration in air below the allowable level of 2 mg. per cubic metre. A list of special precautions necessary when handling beryllium is given. Plutonium presents many hazards to health. It is pyrophoric, extremely toxic, and fissionable. It is usually handled in large quantities, and it gives off a variable amount of gamma radiation. Suitably constructed glove boxes pressurized with an inert gas are used when handling plutonium. A list of basic principles to be considered when using this substance is given.

Partners in Social Medicine.

C. Fraser Brockington (*Public Health*, November, 1959) discusses the relationship between the general practitioner and the medical officer of health. The general practitioner is concerned with the medical care of the individual. The medical officer of health is concerned with care of the community as a whole in his area. According to the author, the science which seeks to preserve health may be applied in five stages: the promotion of health, the prevention of disease, the early detection of disease, after care, and amelioration of permanent handicaps. The general medical practitioner has an important part in each of these stages in regard to the individual or the family group. The general practitioner may assist the medical officer of health and the health authority in reporting sanitary defects, and peoples and families who require the assistance of the social welfare organizations of the health authorities. The author suggests that the ideals of individual health and community health can be united in the health centre where, in one building, general medical practitioners, nurses, social workers and other para-medical workers, preventive health clinics and facilities for health education can be brought together, and the persons concerned operate as a team to protect the health of the family unit upon which community health depends.

Coronary Heart Disease.

T. Dawber *et alii* (*Amer. J. publ. Hlth*, October, 1959) report the results of a six-year follow-up study of factors related to the development of cardiovascular disease. Evidence on the effect of national origin, educational status, and smoking and drinking habits on coronary heart disease was collected. Previous investigations have confirmed that hypertension and hypercholesterolæmia are the most important among a number of factors investigated. During the years of the survey no association between national origin and coronary heart disease was found. An inverse association between educational status and coronary heart disease was disclosed, the disease being less frequent in people with higher educational standards. There was also a low incidence in one of the eight areas surveyed. This area differed from others in some respects but no explanation was found. Smoking was associated with an increased incidence of non-fatal myocardial infarction and of death from coronary heart disease in men from 45 to 60 years of age. It was not associated with an increased incidence of angina pectoris. Cholesterol levels were higher among cigarette smokers than among non-smokers and higher among those who had smoked and stopped than among those who had never smoked. Neither relative weight nor blood pressure showed a similar association with smoking. Alcohol consumption, *per se*, was not associated with coronary heart disease, although heavy alcohol intake was associated with heavy smoking.

Stingray Injuries.

F. Russell (*Publ. Hlth Rep.* (*Wash.*), October, 1959) states that over a five-year period stingrays injured 1097 people in the United States. Sixty-two were admitted to hospital, mainly for surgical treatment of wounds caused by the stings. Eight were treated for systemic effects caused by introduced toxin and two died. *Urolophus halleri*, the stingray which causes most injuries to people in the United States, has one or two stings 2 to 6 cm. in length. The giant stingray of Australia, *Bathytoshia*, has a caudal spine or sting which may be 42 cm. long. The sting is encased in an integumentary sheath and the venom is contained within

the ventro-lateral grooves. The toxic fractions of the venom are soluble proteins of average molecular weight which are extremely labile and rapidly inactivated by heating. While the venom produces changes in the respiratory and central nervous systems, its principal action is on the cardio-vascular system. The chief complaint following a sting by one of these animals is severe pain. Syncope, weakness, nausea, nervousness and sweating are common complaints. Vomiting, diarrhœa, tremors, generalized cramps, inguinal or axillary pain, and respiratory distress are less frequently reported. Cardiac arrhythmias, paræsthesiæ and convulsions may occur. Treatment is aimed toward alleviation of pain, prevention of complications which may be evoked by the venom, and prevention of secondary infections by the administration of antibiotics and tetanus prophylaxis. The integumentary sheath, if present, should be removed, and the wound irrigated and soaked in hot water for about an hour, and then closed.

PHYSICAL MEDICINE AND REHABILITATION.

Mobility of the Cervical Part of the Spine.

F. J. KOTTKE AND M. O. MUNDALE (*Arch. phys. Med.*, September, 1959) state that evaluation of motion in the neck is difficult, because of the short, broad vertebræ buried beneath soft tissue which is thick in relation to the lengths of the moving segments. Evaluation is further complicated because the relatively spherical head does not provide good reference points for evaluation of motion. Since there is greater mobility at the upper and lower ends of the neck than in the mid-cervical region, unit concept of cervical motion is made even more inaccurate. Motion between adjacent vertebræ should and must be studied radiologically. Cinefluorography promises considerable assistance in evaluation of the relative positions and motions of adjacent vertebræ. In view of current techniques and understanding of the kinesiology of cervical motion, single figures of ranges of motion in the three primary perpendicular planes as indices of joint motion should no longer be accepted. Studies should attempt to indicate the specific joints involved when there is limitation of motion.

Orthopædic, Diagnostic and Therapeutic Considerations in Neck Injuries.

H. E. BILLIG (*Arch. phys. Med.*, September, 1959) sets out the special orthopædic considerations relating to diagnosis and treatment of neck injuries. He states that, by means of a gliding motion on the facet joints, the neck can tilt forward, backward and sideways, as well as rotate. The range of motion is limited by joint ligaments surrounding the entire circumference of the facet joints. If the head and neck are forced in any direction past the normal range of allowable motion, then destructive compression damage occurs to the structures of the neck on the side of the direction of the motion, and distension damage occurs on the opposite side. Any facet joint dislocations or subluxations must be reduced and the facet joint ligaments allowed to heal. The neck must be gradually mobilized by repeated traction, so as to free the nerves and blood vessels from the constricting fibrous irritation. Autonomic blocking agents, such as chlorpromazine, hexamethonium and "Pro-Banthine", serve a useful purpose in the early stages of repair.

A Method of Evaluating Disability.

J. SOKOLOW *et alii* (*Arch. phys. Med.*, October, 1959) state that the need for an objective method of evaluating disability has become more pressing with the advance of rehabilitation. They discuss the development, outline and use of new tentative forms for classifying the physical, social, emotional and vocational capacities of the handicapped, and present the results of a pilot study on 124 patients. In this series the forms were used to check their validity, their practicability and their value as a rapid, easy source of statistics, and also to determine whether there was need to revise them in any way. It was shown that the forms provided a method of evaluating disability from a functional point of view. The authors state that, when the forms have been revised, they will again be tested on a large group of patients at several institutions. The last phase of this project will involve testing these forms in use by organizations and groups interested in the functional evaluation of disability.

Structural Injuries in the Cervical Part of the Spine.

R. JACKSON (*Arch. phys. Med.*, September, 1959) states that it is often difficult to determine the extent of an injury to the cervical part of the spine, and it is just as difficult to estimate the amount of residual disability. However, it can with certainty be predicted that there will be some permanent disability from the inevitable degenerative changes that will occur to decrease the functional efficiency of the cervical part of the spine. The functional demands on this area in each case are of importance in determining the amount of permanent disability. The author quotes four illustrative cases, and states that in ensuing years it will be possible to follow more patients who have sustained neck injuries, so that the changes that occur will be better determined. Clinical examinations and radiographic studies over a period of 10 to 20 years are necessary.

Muscle Training for Pectoral Cineplasty.

A. F. GALE AND J. T. HUESTON (*Aust. J. Physiother.*, November, 1959) discuss pectoral cineplasty for patients with short above-elbow stumps or shoulder disarticulations. They state that by this procedure such patients may independently activate the hand unit by the pectoral muscle motor while flexing the elbow by shrugging the shoulder. They stress the importance of pre-operative training, for which three weeks are required, and which follows the following plan: (i) static contractions of the pectoralis major for five minutes every hour; (ii) static contractions of the pectoralis major on the sound side; (iii) hard resistance exercises for the pectoral muscles on both sides, to prevent the development of trick movements; (iv) shoulder mobility exercises on the amputation side; (v) bilateral strengthening exercises for the shoulder girdle; (vi) strict postural correction. The procedure at operation is described, and it is stated that post-operative exercises may commence when healing has occurred, usually during the third week. The procedures for biceps cineplasty described in an earlier paper are followed, with some modifications. The authors state that they have one patient with a humeral stump only 5 in. long who has returned to his previous occupation as a toolmaker, using an upper limb prosthesis with the terminal device operated by a pectoral cineplasty.

The RIC Plastic Tenodysis Splint.

C. SABINE *et alii* (*Arch. phys. Med.*, December, 1959) describe an experimental tenodysis splint developed at the Rehabilitation Institute of Chicago. They state that the three basic criteria for an ideal tenodysis splint are (i) minimal loss of power through friction, (ii) cosmetic acceptability, and (iii) self-application. With these objects in mind, the use of polyester resin has been explored. The authors believe that the RIC splint more nearly meets the criteria than does a metal splint. They state that, while clinical application has so far been limited, the results have been sufficiently gratifying to merit more widespread consideration of the splint in relation to hand disability problems.

Short-Wave, Micro-Wave and Ultrasonic Diathermy in Heating the Hip Joint.

J. F. LEHMANN *et alii* (*Arch. phys. Med.*, December, 1959) made a comparative study of the efficiency of short-wave, micro-wave and ultrasonic diathermy in heating the hip joint, using adult pigs. These animals were chosen because of their similarity in size to adult humans, and because the ratio of skin, fat, muscle and bone is also comparable. It was shown that the temperature of the hip joint could be raised to any desired level by the application of ultrasound. Since the rise of temperature measured in that part of the joint directly exposed to ultrasound was much greater than that recorded where the ultrasonic beam had first traversed the bone, the authors hold that it seems advisable to treat the joint from all aspects. The anterior, superior and posterior aspects of the hip are readily accessible for treatment in human beings. Micro-wave and short-wave diathermy did not produce a temperature within the therapeutic range in the hip joint. It is assumed that the experimental findings obtained with these forms of energy can be explained by the differences in the depth of penetration, the most important determining factor being the thickness of the subcutaneous fat and musculature covering the area being treated. The authors state that their study does not take into consideration the possible contributions of non-thermal effects to the therapeutic results.

Medical Practice.

SUMMARY OF THE REPORT OF THE STANDING COMMITTEE ON RADIO-ISOTOPES SUBMITTED TO THE FORTY-EIGHTH MEETING OF THE NATIONAL HEALTH AND MEDICAL RESEACH COUNCIL.

RADIO-ISOTOPES for medical purposes first became available in Australia in 1946 on export from the United States of America. The National Health and Medical Research Council, believing that the use of radio-isotopes in medicine should be under the control of a competent advisory committee, in 1947 established its Standing Committee on Radio-isotopes to approve applications in Australia for radio-isotopes to be used on humans. The Committee[1] is made up of two pathologists, two physicians, two radiotherapists and two radiological physicists. To facilitate the work of this Committee, the Council established in the various States (except Victoria) Therapeutic Trials Committees to act, under the Standing Committee on Radio-isotopes, in exercising the necessary control of the use of radio-isotopes on humans. Since all the members of the Standing Committee are in Melbourne, that Committee also serves as the Therapeutic Trials Committee in Victoria.

In submitting a report to the forty-eighth meeting of the National Health and Medical Research Council, the Standing Committee on Radio-isotopes recommended that a summary of it be forwarded to THE MEDICAL JOURNAL OF AUSTRALIA for publication. The Committee made the recommendation because it believed that much of the information contained in the report would be of considerable interest and value to the medical profession. The Council concurred with the recommendation, and makes available the following summary for publication.

Use of Radio-Isotopes for Medical Purposes.

General.

The Committee relies on the Therapeutic Trials Committees in the States[2] to recommend the issue of those radio-isotopes for which well-established applications in medical practice exist. The Committee wishes to record the contributions made by the State Therapeutic Trials Committees and in particular by their chairmen. The Standing Committee directs its attention particularly to new applications, which should be submitted to it through the appropriate State Therapeutic Trials Committee. In considering applications, the Standing Committee takes account of the possible advantages of the use of radio-isotopes over clinical methods already established, and pays special attention to the radiation exposure of the individual and of the community which the use may bring with it.

The Committee believes that it would be of interest to record the extent to which radio-isotopes are being used in medical practice in Australia. Data on the issues of radio-active solutions and colloids that have been made in the last five years from the Commonwealth X-ray and Radium Laboratory are given in Table I. In the case of some of the labelled compounds, bulk supplies of radio-isotopes are obtained by the Commonwealth X-ray and Radium Laboratory, and from these supplies doses for individual patients are dispensed by it. On the other hand, for those radio-isotopes in less or variable demand, either the Laboratory procures the actual activity required for a particular patient (e.g., radio-colloidal gold-198), or it procures and issues a small bulk supply to enable those hospitals properly equipped and staffed to dispense the doses required during a particular period. Returns giving the details of the use of these small bulk supplies are requested from hospitals.

All the radio-isotopes listed in Table I and in the forms stated are made available at no charge for all classes of patient under Section 100 of the *National Health Act*. The cost is borne by the National Welfare Fund.

[1] Professor Edgar King and Sir Peter MacCallum; Dr. Keith Fairley and Dr. W. E. King; Dr. W. P. Holman and Dr. R. Kaye Scott; Mr. D. W. Keam and Mr. D. J. Stevens (Chairman).

[2] The chairmen of the Therapeutic Trials Committees in Queensland, New South Wales, South Australia and Western Australia are Dr. A. G. S. Cooper, Dr. H. J. Ham, Dr. C. M. Gurner and Dr. A. J. M. Nelson respectively. All applications in those States for radio-isotopes for use on humans should be directed in the first instance to the appropriate chairman. In Victoria and Tasmania applications should be forwarded to the Standing Committee on Radio-isotopes, through the Director, Commonwealth X-ray and Radium Laboratory, 30 Lonsdale Street, Melbourne, C.1.

In the years 1954-55, 1955-56, 1956-57, 1957-58 and 1958-59, the total shipments of radio-isotopes imported by the Commonwealth X-ray and Radium Laboratory for medical, research and industrial purposes were 176, 238, 431, 657 and 660. Of these total shipments, 39%, 44%, 36%, 41% and 48% respectively were imported as solutions and colloids for medical diagnosis and treatment. These percentages do not include solid sources of radio-isotopes imported for medical purposes in the form of cobalt-60 rods and wires and strontium-90 beta ray applicators.

It is appropriate to comment briefly on the use of several of the radio-isotopes listed in Table I. Iodine-131 as iodide is used in tracer tests to determine the functioning state of the thyroid. The number of tracer doses dispensed by the Commonwealth X-ray and Radium Laboratory has increased fourfold in the five-year period reviewed, and the activity of iodine-131 issued as tracer doses has, in the same period, increased only twofold. Comparing the issues for the years 1957-58 and 1958-59, although the number of tracer doses increased by 2·5%, the total activity issued has decreased by 43%. The decrease in total activity results from the reduced activity administered in each tracer dose, and arises in general from the use of scintillation counter systems instead of the Geiger counter systems earlier used. This trend is desirable, since it reduces the radiation dose to the patient and to personnel preparing and administering the dose.

Table I also shows the increase which has occurred in the use of iodine-131 as iodide in the treatment of thyrotoxicosis. In Table I, "Therapy" includes the number of cases of thyrotoxicosis treated as well as a limited number of suitable cases of carcinoma of the thyroid and metastases. The numbers of cases of thyrotoxicosis treated in the years 1954-55, 1955-56, 1956-57, 1957-58 and 1958-59 are 194, 267, 410, 515 and 509 respectively, representing an increase of two and one-half times over the period.

It is of particular interest to note the change in policy which has occurred in the use of radio-active colloids in the treatment of malignant effusions in serous cavities. The reason for this is discussed in a later section; but it will be noted from Table I that the use of radio-active colloidal gold-198 has been halved in the year 1958-59 as compared with the year 1957-58.

The Standing Committee feels that it should reaffirm its policy with regard to the approval of the use of radio-isotopes, as solutions and colloids, on humans. It draws the attention of the Council to the following resolution.[3]

> The Standing Committee on Radio-isotopes of the National Health and Medical Research Council notes that, in Australia, the medical use of radio-isotopes, both in diagnosis and therapy, has steadily expanded.
>
> It re-affirms its policy that the use of radio-isotopes in medicine:
>
> (*a*) should be determined by clinical necessity after proper evaluation has been made of all possible methods including those not involving the use of radio-isotopes;
>
> (*b*) should be carried out only where proper facilities are available for safe handling and administration of the radio-isotopes and for evaluation of clinical and physical material;
>
> (c) should be carried out only where clinicians experienced in their use are available.
>
> The Standing Committee on Radio-isotopes is strongly opposed to practices which depart from this policy and, in particular, to any suggestion of active promotion of the use of radio-isotopes which could lead to such departures.

Specific Applications.

For the information of Council, comment on the use of some of the radio-isotopes listed in Table I is given below.

(*a*) It was indicated in its report to the forty-fourth and forty-fifth meetings of the Council that the Committee had sought the cooperation of the Cancer Institute Board (Victoria) in the investigation of clinical aspects of the use of colloidal chromic phosphate labelled with radio-phosphorus (P^{32}) as an alternative to radio-colloidal gold (Au^{198}) in the treatment of malignant effusions in serous cavities. Radio-colloidal gold (Au^{198}) has been used in activities of 100-150 millicuries per patient. It emits gamma as well as beta rays, and creates problems in the protection of staff administering the material and nursing

[3] The National Health and Medical Research Council adopted the resolution at its forty-eighth meeting.

TABLE I.

Radio-Isotopes Dispensed at or Issued from the Commonwealth X-Ray and Radium Laboratory as Solutions and Colloids for Medical Diagnosis and Treatment.

Isotope.	Chemical Form.	Use.	1954–1955.		1955–1956.		1956–1957.		1957–1958.		1958–1959	
			Number of Issues.	Millicuries at Use.	Number of Issues.	Millicuries at Use.	Number of Issues.	Millicuries at Use.	Number of Issues.	Millicuries at Use.	Number of Issues.	Millicuries at Use.
Phosphorus-32 (P^{32})	Orthophosphate in hydrochloric acid[1]	Therapy.	199	655	182	799	295	1157	237	1237	242	1280
		Diagnosis.	—	—	—	—	—	—	26	12	30	16
	Orthophosphate in isotonic solution[1]	Diagnosis.	—	—	—	—	50	1	2	1	—	—
	Colloidal chromic phosphate.	Therapy.	—	—	—	—	—	—	13	121	16	172
	Colloidal zirconium phosphate.	Therapy.	—	—	—	—	—	—	—	—	3	34
Iodine-131 (I^{131})	Iodide[1]	Therapy.	199	2162	297	3975	480	8377	557	9278	541	8779
		Diagnosis.	1098	58	2587	118	3762	159	4305	192	4411	110
	Human serum albumin.	Diagnosis.	—	—	—	—	7	5	32	17	39	37
	Diodrast ..	Diagnosis.	—	—	—	—	—	—	1	1	12	7
	Rose bengal ..	Diagnosis.	—	—	—	—	—	—	1	1	—	—
	Triolein	Diagnosis.	—	—	—	—	—	—	11	10	37	37
	Oleic acid ..	Diagnosis.	—	—	—	—	—	—	—	—	17	9·7
	Gamma globulin	Diagnosis.	—	—	—	—	—	—	—	—	5	1·6
Chromium-51 (Cr^{51})	Chromate in isotonic saline[1] ..	Diagnosis.	3	7	96	16	990	70	907	129	761	113
Gold-198 (Au^{198})	Colloidal gold ..	Therapy.	10	1190	31	3640	43	4983	55	7583	28	3211[2]
Iron-59 (Fe^{59})	Ferric chloride[1]	Diagnosis.	—	—	—	—	—	—	64	0·7	75	0·8
Cobalt-58 (Co^{58})	Vitamin B_{12} ..	Diagnosis.	—	—	—	—	—	—	42	0·25	138	0·8

[1] Individual doses dispensed at the Commonwealth X-ray and Radium Laboratory before issue.

[2] The reduction in issues and activity compared with the previous year is largely accounted for by the use of colloids labelled with phosphorus-32 as a replacement for colloidal gold-198. A further reduction in the use of colloidal gold-198 can be expected.

the patient. The half-life of Au^{198} is 2·69 days. On the other hand, phosphorus-32 (P^{32}) is a pure beta-ray emitter, and the radiation hazard to personnel can be reduced considerably. The half-life of P^{32} is 14·3 days, and its more energetic beta rays could be expected to give a better dose at depth in the wall of the serous cavity. It can be estimated that 10 millicuries of the P^{32} colloid would deliver approximately the same radiation dose to the serous wall as 100 millicuries of the Au^{198} colloid.

The colloidal chromic phosphate (P^{32} labelled) supplied to the Cancer Institute Board (Victoria) was obtained from the Radiochemical Centre, Amersham, England. Although the material was dialysed to remove ionic phosphate before dispatch from England, tests at the above institute showed that the activity of P^{32} as ionic phosphate before use ranged from 4% to 23%, with the value for most issues lying between 10% and 20%. These levels suggested the desirability of dialysing the material before administration.

The first stage of the investigation referred to the Cancer Institute Board (Victoria) has been completed. A paper, "Studies of the Effect of a Colloidal Radio-active Chromic Phosphate in Clinical and Experimental Malignant Effusions", by H. A. S. van den Brenk, K. H. Clarke, W. P. Holman and Carmyl Winkler[4] has been accepted for publication by the *British Journal of Cancer*. The conclusion and summary of this paper is reported below:

> It is considered that the use of radioactive colloidal chromic phosphate as prepared by the Radiochemical Centre, Amersham, can be recommended for the treatment of malignant serous effusions since the hazard to the patient is small, particularly if the material is dialysed prior to administration. There are no toxic effects as experienced with cytotoxic drugs and the hazard to staff handling the material and nursing the patient is negligible compared with radioactive colloidal gold.

The Standing Committee, on the basis of the above findings, recommended the use of colloidal chromic phosphate (P^{32} labelled) in preference to radio-colloidal gold. Unfortunately, due to production problems at the Radiochemical Centre, Amersham, the change-over from colloidal gold-198 to colloidal chromic phosphate P^{32} has, so far, only been partial.

During the above investigation, the Radiochemical Centre offered colloidal zirconium phosphate also P^{32} labelled. This appeared to have the following advantages: the colloid was stated to be stabilized and dissociation could be expected to be very small, and in addition the price per millicurie of activity was half that for the chromic phosphate.

[4] The paper has now been published: *Brit. J. Cancer*, 1959, 12:181 (June).

The Standing Committee invited the Cancer Institute Board (Victoria) to carry out a short-term clinical study of the new material. As was to be expected, no difference in clinical response occurred between the two colloids. Measurements showed that, on dialysis, the ionic phosphate in the zirconium phosphate was less than that in the early issues of chromic phosphate. However, it has been noted that recent shipments of chromic phosphate have improved considerably in stability, and, in fact, less dissociation was present than in zirconium phosphate. The investigations are continuing. If subsequent shipments of these colloids have the same low level of dissociation as recent shipments, it is considered that dialysis before use will not be necessary.

(*b*) A request was received for a small supply of I^{131} labelled L-tri-iodothyronine to investigate the method described by Hamolsky *et alii* (*J. clin. Endocr.*, 1959, 19:103) for assessing thyroid function. This request was approved, and, subsequently to receiving advice of the results of the preliminary work, approval was given for regular monthly supplies. One merit of the use of this labelled compound is that it is not administered to the patient but added to a blood sample taken from the patient. Accordingly no radiation dose is received by the patient as a result of this diagnostic test.

(*c*) With a view to reducing the radiation dose to patients during diagnostic tests with radio-iodine, increasing use is being made overseas of the short-lived radio-isotopes of iodine, iodine-132 (I^{132}), which has a half-life of 2·3 hours. This radio-isotope is a daughter product of radio-active tellurium-132. It can be separated by chemical means from an irradiation unit of the parent element. The Committee is interested in the possible use of I^{132} instead of I^{131} (half-life eight days), because of the reduction that would be effected in the radiation dose to patients from tests to determine thyroid function.

It has been agreed by the Committee that, prior to recommending the routine use of I^{132}, the procedure for chemical separation, its assay and its use on patients should be investigated. Preliminary arrangements have been made for this work to be carried out through the cooperation of the Royal Melbourne Hospital and the Commonwealth X-ray and Radium Laboratory.

(*d*) In 1958, the Committee supported an application made to the Council by Dr. T. H. Oddie, Institute of Medical Research, Royal North Shore Hospital, for funds to cover air freight, etc., for the circulation in Australia of mock-I^{131} "mannikins" made available by the Medical Division, Institute of Nuclear Studies, Oak Ridge. These "mannikins" were intended to permit institutions carrying out tests of thyroid function with I^{131} to check the accuracy of their measuring systems. Recently Dr. Oddie forwarded to the Committee a report of the checks

carried out with these "mannikins", which were used by institutions in Brisbane, Sydney, Newcastle, Melbourne, Launceston, Adelaide and Perth. The Institute of Nuclear Studies, Oak Ridge, has offered further "mannikins" on loan, and the Committee has supported an application for a supplementary grant made to the Council by Dr. Oddie to defray transport costs in Australia.

(e) Reference to Table I shows that in the year 1957-58, importation commenced of a series of special compounds labelled with I^{131}. Although there has been some fluctuation in the use of particular compounds, the over-all demand for these compounds as diagnostic aids has been maintained in the year 1958-59.

Recently requests have been received for polyvinyl pyrrolidone (P.V.P.) labelled with I^{131}. Dr. R. S. Gordon, of the National Institute of Health, Bethesda, U.S.A., has developed this labelled compound and has applied it to determine the loss of protein through the bowel lumen in cases of hypoproteinæmia (*Lancet*, 1959, January 14, page 325, and *J. clin. Invest.*, 1957, 36: 931). The labelled compound is not available commercially, but, by arrangement with Dr. Gordon, small activities of it have been received at monthly intervals on an experimental basis from the laboratories of the United States Public Health Services. Unfortunately, in the second shipment a large percentage of the I^{131} was present as dissociated ionic iodide.

(f) There has been an increasing use of radio-isotopes in hæmatology. Labelled compounds of chromium-51 (Cr^{51}) and iron-59 (Fe^{59}) are in steady demand.

In addition, the use of vitamin B_{12} labelled with radio-cobalt has increased. The first labelled vitamin B_{12} used in Australia was made available by Dr. Lester Smith, Glaxo Pty. Ltd., England. This was labelled with cobalt-60 (Co^{60}), half-life 5·3 years. After a demand had been created for the labelled vitamin B_{12}, the Radiochemical Centre, Amersham, undertook its production on a commercial basis. The material now available is labelled with cobalt-58 (Co^{58}), half-life 71 days.

Publications.

The Committee notes with interest that, with the expanding use of radio-isotopes in medicine in Australia, the results of investigations and treatments with them here are now being published in the medical literature by the various workers. The Committee supports this publication of results which permits the critical evaluation by others, of the methods and techniques.

Medical Societies.

PÆDIATRIC SOCIETY OF VICTORIA.

A MEETING of the Pædiatric Society of Victoria was held on June 10, 1959, at the Royal Children's Hospital, Melbourne.

Cineradiography and Television Fluoroscopy.

DR. H. HILLER discussed cineradiography and television fluoroscopy. He said that a little over two years previously the Royal Children's Hospital had purchased an image intensifier for the radiology department. Since that time all screening procedures had been revolutionized and the radiation dosage to patients very much reduced. Investigation and research had been undertaken to assess various special applications of that equipment, especially in the pædiatric field. Two such applications were cineradiography and television fluoroscopy. A further development was cine-television-fluoroscopy. Dr. Hiller then showed films to demonstrate those procedures.

The first film began with a demonstration of how an ordinary commercial 16 mm. cinematographic camera had been attached to the image intensifier and how a cineradiographic run was then undertaken. Examples then shown included cystourethograms demonstrating ureteral reflux and congenital urethral obstruction due to valves, the use of a barium bolus showing a baby sucking from a bottle, an unusual œsophageal diverticulum and a demonstration of gastro-œsophageal reflux. Other barium studies included the demonstration of the string sign in hypertrophic pyloric stenosis and of the marked gastric peristalsis seen in that condition. A splenic portagram showed dye passing both through a cavernomatous malformation of the portal vein and through dilated gastric varices. Examples of venous and selective angiocardiograms showed the appearances during the passage of dye in a case of tricuspid atresia (beautifully demonstrating the pulsatile flow in the liver), and a patent ductus with filling of the aorta via the ductus when dye was injected into the pulmonary artery.

The film then showed the unique application of television to the image intensifier, illustrating how it was possible, without increasing the radiation to the patient, to obtain quite an adequate picture on the television screen which could be shown anywhere in the hospital. At the conclusion of the film a method of overcoming the strobe bar effect was explained. That strobe bar effect was normally obtained on trying to film the television screen and had to be removed before adequate cinematographic records could be obtained.

A direct telecast was then undertaken from the main X-ray room in the department of radiology to the lecture theatre. Subjects included a baby sucking a bottle, an infant with gastro-œsophageal reflux, an older child feeding from a spoon, and a subject with a severe ventricular septal defect and marked pulmonary arterial congestion. Those subjects were interspersed with examples to show the detail which was obtainable with that equipment, such as being able to visualize the eye of a needle.

Dr. Hiller then posed and answered a number of questions pertaining to the subjects under discussion. (i) What did an image intensifier do? He said that it increased the brilliance of the fluorescent image a thousand times. That allowed a great decrease in the radiation to the patient and staff and permitted the procedure to be carried out in daylight with macular vision. However, only one person could view the image at one time. (ii) To what uses could cineradiography be put? It allowed a permanent record of any fluorescent procedures, such as the use of barium meals and boluses, heart and chest screenings, intra-venous pyelograms and cystourethrograms during micturition, and angiocardiograms and aortograms. Those cineradiographic studies might be used as diagnostic procedures for both physiological and pathological investigations and research activities. However, the cinematographic record failed when a study of fine detail was essential. It had also to be remembered that the radiation to the patient needed to be greatly increased, and that in turn made repeated cinematographic records of one patient undesirable. (iii) How could television help in radiological investigation? It allowed any number of persons to view the procedure, and that did not necessarily have to be in the X-ray room. It could therefore be used for teaching at all levels, in procedures in which a number of specialists needed to be aware of what was happening and when consultation between radiologists might be helpful. It had also been suggested that in the future it might be of use in diagnosis in outback centres, where the televised image could be sent to the base hospital for viewing by their radiologist. (iv) Could cine-television-fluoroscopy be a useful procedure? If the problem associated with recording the television screen could be overcome, then that procedure would seem to completely replace cineradiography, as the radiation to the patient was the same as in normal fluoroscopy with the image intensifier. That problem of filming the television screen was bound up with the appearance of a strobe bar effect if the speed of the cinematographic camera was not exactly the same as that of the television camera. As the latter's speed varied slightly but continuously, it followed that the judgement of speed of the cinematographic camera could be difficult. One way to overcome that problem was to couple two identical cameras to a variable power drive, to use one camera to view the strobe effect, and to regulate the electric drive speed until the strobe was lifted out of the picture. Then, by throwing a clutch, it was possible to start the second loaded camera at the same speed and so obtain the necessary record, unspoiled by the appearance of the strobe effect.

MR. N. ROSENTHAL (Director of the Visual Aids Department, University of Melbourne) said that he had been particularly interested in Dr. Hiller's paper because he had recently seen two cineradiography films from Rochester, one demonstrating the mechanism of swallowing and another (produced for general use) demonstrating the function of the human skeleton in motion. Examples such as that showed how the medical profession had been outstanding in making the proper use of visual aids. In some courses visual aids were on the fringe of the curriculum, but in medicine they were used in their correct place. A good teacher knew when he felt the need of a visual aid; for instance, a motion picture should be used only when one had to demonstrate motion, not for something static. Time-lapse cinematography was now used extensively to show the truly dynamic nature of certain

slowly-moving processes such as cell division. In regard to medical television, Mr. Rosenthal believed that its use lay in informing not so much the community as the general practitioner. In 1949 he had spent a week at Guy's Hospital, where there was a television camera in the operating theatre with a series of screens throughout the hospital. He believed that for undergraduates that could be very dangerous, as it tended to make operations look too easy. The same risk applied to films of operations, as the camera was unable to emphasize the skill and experience behind the performance of the operation. He believed strongly in the principle that a visual aid must aid. An attempt was being made to develop educational television stations, controlled by educationists; the danger of making the picture rather than the instruction attractive had to be guarded against. Finally he wished to commend the principle that the simpler the aid, the more useful it was.

MR. F. DOUGLAS STEPHENS discussed the clinical applications of the techniques, with particular reference to the group of children with urinary tract infection and pain on micturition—a group which presented many unsolved problems. He said that he had found that the use of the image intensifier and television had stimulated much useful discussion of these problems, and had led to improvements in the design of some operations.

PROFESSOR M. EWING said that the techniques demonstrated had tremendous potential. He had found the films very exciting. It was obvious that the value of those techniques was immense, although limited. One practical use was in documenting the unusual. The image intensifier had a more limited range of usefulness in the adult. The great advantage of television was that it personalized the experience shown. He thought that the strobe problem had been solved.

DR. H. LUKE said that the Royal Children's Hospital had imported the first image intensifier to be used in Melbourne. There were only a few places in the world where those techniques were used in routine work. Although a five-inch intensifier was now standard, an eight-inch model had been designed, but that was not so efficient, for technical reasons. An entirely different approach had been worked out in Holland and Germany, utilizing a mirror camera. The grain of the 16 mm. film used by Dr. Hiller became important when the image was magnified, and for that reason the Dutch were using 70 mm. film. He thought that a five-inch television screen was too small for many adults to view together with convenience. It was difficult to see how a full-width television screen could be used whilst the radiation was limited to a reasonable amount.

DR. W. HARE said that television would definitely become incorporated into radiology. The problem was to intensify the image. It was possible that films might become obsolete, a tape record being used instead. Cinematographic films had been made for years from the normal screen, but that had required too high a radiation dose. The great advantage of the image intensifier was that it permitted viewing without preliminary dark adaptation, even though a little more radiation had to be used.

DR. V. COLLINS said that the place of television in medical education lay in enabling groups of people to view a limited area at the same time. He wondered what place television had in the teaching of operating theatre technique, and whether it might replace galleries.

Professor M. Ewing said that the experience at Guy's Hospital was disappointing in that regard, mainly because the image was only in black and white—colour would be a big improvement. He did not think that television had much place in teaching surgery to undergraduates, although it might be useful for post-graduates. He was opposed to galleries in operating theatres in any case.

British Medical Association.

THE C. H. MILBURN PRIZE.

THE C. H. MILBURN PRIZE for an essay or study on a subject of forensic medicine is offered for the first time in 1960. The value of the prize is £100. Any registered medical practitioner is eligible to compete. Entries must consist of original and unpublished material, and preliminary notice of entry is required. Forms and further particulars may be obtained from the Secretary, B.M.A. House, Tavistock Square, London, W.C.1, England. The closing date for entries is October 31, 1960.

Medical Education.

VICTORIAN MEDICAL EDUCATION COMMITTEE.

THE following extract appeared in the Victorian Government Gazette, No. 30, of April 13, 1960.

MEDICAL EDUCATION COMMITTEE.

The Government has appointed a Committee to advise it upon medical undergraduate teaching in Victoria under the following terms of reference:

To inquire into, report upon, and make recommendations, including comments upon the magnitude and urgency of any proposals, concerning the following matters:

1. Medical Undergraduate Education in Victoria, particularly as it concerns metropolitan teaching hospitals.

2. How the existing hospitals, and those at present proposed, may be best utilized for clinical and/or other teaching in association with the two Universities—Melbourne and Monash.

3. How may the existing hospitals and those at present proposed be brought into teaching association with the University of Melbourne, and/or the Monash University in the most expeditious and efficient manner, having due regard to economy.

4. What will be the effect of the establishment of the proposed Monash University Medical School upon the State Hospital building programme; whether the programme will need to be materially altered and, if so, to what extent and at what stage.

5. Any other matters which appear to the Committee to be relevant to the inquiry.

Any interested parties desirous of placing submissions before the Committee may do so, in writing, to Secretary, Medical Education Committee, c.o. Hospitals and Charities Commission, I.C.I. House, I Nicholson Street, Melbourne, by Monday, 9th May, 1960.

Out of the Past.

THE ROYAL ARMY MEDICAL CORPS.[1]

[From the *Australasian Medical Gazette*, June, 1898.]

THE British Medical Journal for May 7th announces the inauguration of a long asked-for reform. In this Corps medical officers will bear the same military titles as other army officers up to that of colonel. Above that rank the title will be surgeon-general with the rank and precedence of a general officer in the army.

In granting this reform the Home Ministry, through the Secretary of State for War, has removed one of the grievances of the medical profession. Lord Lister in approving of the measure stated "that Lord Lansdowne had removed a terrible cloud from the medical profession and a terrible evil from the nation".

The British Medical Association may justly claim a large share of the credit of this result and we heartily join with the parent journal in hoping that the olive branch so gracefully offered by Lord Lansdowne will be as gracefully and loyally accepted by the profession and by the army.

Correspondence.

GENERAL PHARMACEUTICAL BENEFITS.

SIR: With no small degree of dismay and indignation, I have watched the sequence of events concerned with the Government's new Pharmaceutical Benefits Scheme.

Having experienced at first hand the professional degradation and frustration which exists, especially in the case of the general practitioner, in the National Health Service in England, I fear that the medical profession in

[1] From the original in the Mitchell Library, Sydney.

this country is heading for a similar fate if it does not shake itself from its present state of torpor and apathy. Here we find ourselves cooperating in a scheme which not only is cumbersome and full of anomalies, but which places us in the invidious position of control by regulation from Canberra: control by regulation, requiring no parliamentary supervision, but subject merely to the whim of the Minister and his advisers. It should also be noted that disciplinary measures exist for those who do not carry out these regulations to Canberra's satisfaction. What is on the free list and what is not, in my opinion, is of no real consequence. The main point is that the profession is being used as a cover for the Government's half-hearted attempts to provide "free medicine".

If the Government wants to provide free medicine, it is surely nothing to do with the medical profession. Why should we face penalties and censure because we contravene arbitrary governmental regulations which have no bearing on our patients' welfare or the practice of medicine? Surely if "free medicine" is the order, the mechanics of what the Government will or will not pay for should be a matter between the Government and the chemist. We have, unfortunately, by cooperating in this scheme, become involved in "medicine the politicians' plaything", and we can only become more deeply involved unless we cry halt now.

While many correspondents have criticised Federal Council, I feel the main blame surely rests with the body of the profession. Look at these columns, Sir; how many cries of protest do we see from Queensland, Western Australia, South Australia or Tasmania? Even Victoria has been poorly represented in letters to the Journal. Can it be that doctors in these States do not appreciate the dangers of the situation, or is it that they do not care? Even in this State, which from all reports has been the most vocal in its opposition to the Scheme, how many doctors have written in protest? It would be interesting, for example, to know what percentage of doctors in New South Wales at the date of writing have actually sent in their reply to the plebiscite which was distributed some weeks ago.

It merely remains, Sir, for me to attempt some constructive suggestions, believing as I do that the overwhelming majority of doctors are opposed to any form of Government regimentation or nationalized service. I would like to see the results of a national plebiscite on the same lines as that conducted by the New South Wales Council in this State. Thus armed, Federal Council should then give Canberra adequate notice of our refusal to further cooperation beyond, perhaps, agreeing to write our prescriptions in duplicate. The size of the prescription pads, the number of items per prescription, the quantities, the number of repeats and the nature and brand of the items prescribed would then be our own personal responsibility, as it should always be if medicine is to remain a free and honourable profession.

Yours, etc.,

80 Penshurst Street,
Penshurst, N.S.W.
April 5, 1960.

LIONEL L. WILSON.

SIR: It is now one month since the widened *Pharmaceutical Benefits Act* came into operation, and I feel that it is time for the profession to take stock of the position and decide whether or not they should continue with the scheme as it has been foisted on to them by the Commonwealth politicians. Not only has the scheme been pushed on to the profession without prior consultation, but with what seems to me to have been quite unnecessary secrecy and haste.

In October, 1958, Dr. the Honourable D. A. Cameron, Minister for Health, opened a symposium conducted by the School of Hospital Administration at the University of New South Wales. Among the remarks he made during his opening speech were these: "How fortunate we are that in Australia medical practice is founded on the general practitioner and family doctor. How important it is that this should continue and that nothing should be done to interfere with the freedom, the relationships and the standards of general practice."

How different is this to what the medical profession now has to contend with!

On March 4, 1960, I wrote a letter to Dr. Cameron, bringing up six points in regard to the new scheme which had cropped up in the first four days I was struggling with my new "bible". So far I have not received even an acknowledgement of my letter, let alone a reply to my queries.

I have also written to my local Federal Member and asked for an interview with him in regard to the new scheme. Mr. Howse did come to Orange on March 12, 1960, but waited until two days later to write to me about his trip to Orange, and that he had been too busy with electoral conferences to see me.

From these instances I can only gain one impression—put not your trust in politicians. They will promise you anything, but still push you along the paths of their own devious design. If the Australian medical profession wish to retain their high standards, and not descend to a state of being mere "clinical clerks" and "pill peddlers", then now is the time for them to make their decision and take their stand.

I am quite sure that the Federal Council decision of late February was not a majority decision of the medical profession of Australia, and now is the time for the Federal Council to ascertain the majority decision of the medical profession by plebiscite and act accordingly.

Yours, etc.,

United Insurance Building,
193-5 Summer Street,
Orange, N.S.W.
April 2, 1960.

LYLE G. DEITHE.

Notes and News.

Change of a Hospital Name in New South Wales.

In future the Home of Peace Hospital at Petersham, New South Wales, will be known as "Eversleigh". This step has been taken in order to overcome certain difficulties associated with the title "Home of Peace". Although the official name will still be "Home of Peace Hospital", each hospital will be known by its house name—"Eversleigh" (Petersham), "Neringah" (Wahroonga).

The word "Home" in the title has caused confusion as to the real nature of the work undertaken. The hospital has quite often been wrongly thought to be a convalescent or rest home or merely a home for elderly people, when in fact it is a hospital specializing in the care of advanced chronically ill or terminal patients. Not only has this confusion existed amongst the general public, but it has been found amongst the medical and nursing professions.

Wanted: Index for The Medical Journal of Australia, Volume II, 1949.

A copy of the Index for Volume II, 1949, of THE MEDICAL JOURNAL OF AUSTRALIA is required for the Burkitt Library, Old Medical School, University of Sydney. We are unable to supply this and should be grateful if any reader could help. It is the only item now missing from a valuable run presented to the library by the late Professor A. N. Burkitt.

Supply of Vaccines.

The Commonwealth Minister for Health, Dr. D. A. Cameron, has announced that vaccines will continue to be supplied by the Commonwealth free of charge to State and local government health authorities for mass immunization campaigns. This free distribution is not affected by the introduction of the new Pharmaceutical Benefits Scheme. It is made on the condition that patients treated in mass immunization campaigns are not charged for the vaccine by the State or local government health authority. This applies to vaccines for whooping cough, tetanus and diphtheria. The Commonwealth also supplies polio vaccine free to the State Governments, which distribute it in various ways, mainly through their Departments of Health or local government authorities.

Dr. Cameron said that the Commonwealth Serum Laboratories distributed a triple antigen which offered immunity against whooping cough, tetanus and diphtheria. Vaccines to give immunity against whooping cough, tetanus and diphtheria were available through private doctors, either separately or as triple antigen, as a pharmaceutical benefit. At present, polio vaccine was available only through governmental authorities, for mass immunization. Local government authorities wanting triple antigen for mass immunization campaigns should apply to the Commonwealth Directors of Health in their State, through the State Health Department.

Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

WEEK-END CONFERENCES.

THE Post-Graduate Committee in Medicine in the University of Sydney announces the following post-graduate week-end conferences.

Bathurst.

A conference will be held in the Nurses' Lecture Theatre, Bathurst District Hospital, on Saturday and Sunday, April 23 and 24, 1960. The programme is as follows:

Saturday, April 23: 2 p.m., registration; 2.30 p.m., "Types of Anæmias in Pregnancy", Dr. Richmond Jeremy; 4 p.m., "Traumatic Chest", Dr. Rowan Nicks.

Sunday, April 24: 10 a.m., "Drugs and the Blood", Dr. Richmond Jeremy; 11.30 a.m., "Cardiac Surgery", Dr. Rowan Nicks; 2 p.m., "The Management of Prostatic Obstruction", Dr. James Blackwood.

A cancer demonstration will also be presented during the course.

Those wishing to attend are requested to notify Dr. R. G. B. Cameron, 142 William Street, Bathurst. Telephone: Bathurst 2345.

Wagga Wagga.

A conference will be held in the Nurses' Lecture Theatre, Wagga Wagga Base Hospital, on April 30 and May 1. The programme is as follows:

Saturday, April 30: 2 p.m., registration; 2.15 p.m., "Hæmatemesis", Dr. S. H. Lovell; 3.30 p.m., "Coronary Disease", Dr. Frank L. Ritchie.

Sunday, May 1: 10 a.m., "Management of Head Injuries", Dr. S. M. Morson; 2 p.m., "Non-Malignant Tumours of the Breast", Dr. S. H. Lovell; 3.15 p.m., "Anuria, with Reference to Artificial Kidney", Dr. Frank L. Ritchie.

Those wishing to attend are requested to notify Dr. G. Pattison, Honorary Secretary, Southern Districts Medical Association, 64 Macleay Street, Wagga Wagga. Telephone: Wagga 9268.

Fees.

The fee for attendance at both of the foregoing conferences is three guineas.

Newcastle.

A course in pædiatrics will be held in Room 358, University of Technology, Maitland Road, Islington, Newcastle, on April 30 and May 1. The programme will consist of four symposia conducted by the following group of pædiatricians: chairman, Professor Lorimer Dods; speakers, Dr. A. Tink, Dr. J. Beveridge and Dr. W. Grigor.

Saturday, April 30: 2 p.m., registration; 2.15 p.m., "Artificial Feeding of the 'Normal' Full-Time Infant During the First Six Months of Life"; 3.45 p.m., "The Case For and Against Antibiotics and Surgery in Upper Respiratory Tract Infection During Infancy and Childhood".

Sunday, May 1: 9.30 a.m., "Emotional and Behaviour Disorders of Infancy and Childhood"; 11 a.m., "Asthma in Childhood".

The 1960 conference at Newcastle will be in three sections: (i) pædiatrics, as above; (ii) medicine, August 13 and 14; (iii) surgery, October 22 and 23. The combined fee for attendance will be three guineas, or one guinea for each section. Those wishing to attend are requested to notify Dr. R. V. Dan, Honorary Secretary, Central Northern Medical Association, 17 Bolton Street, Newcastle. Telephone: Newcastle B 2244.

SEMINARS AT SYDNEY HOSPITAL.

THE following seminars will be held at Sydney Hospital during May and June, 1960.

May 4: "The Physiological Management of Heart Failure", Professor J. McMichael, Post-Graduate Medical School, London.

May 11: "The Hæmolytic Anæmias", Dr. B. J. Lake, Dr. B. L. Walker, Dr. R. J. Elvy, Hæmatology Clinic.

May 18: "Management of Depression", Dr. D. C. Maddison, Senior Lecturer, Department of Psychiatry, University of Sydney.

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED MARCH 19, 1960.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	1(1)	4(1)	7(2)	1	1(1)	..	..	..	14
Amœbiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	..	..	..	..	..	..	8	..	8
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	..	..	..	..	..	..	..	..
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	1	..	..	..	1	..	..	..	2
Dengue	..	..	..	..	..	..	..	..	..
Diarrhœa (Infantile)	9(2)	6(5)	5	..	1	..	5	..	25
Diphtheria	..	..	..	..	1	..	..	..	1
Dysentery (Bacillary)	..	1	..	5(5)	5(4)	..	1	..	12
Encephalitis	..	3(3)	..	..	..	..	..	..	3
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	1(1)	..	..	..	..	..	..	1
Infective Hepatitis	62(19)	29(17)	13(7)	9(6)	8(2)	1(1)	..	..	122
Lead Poisoning	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	..	..	..	..	..
Leptospirosis	2	..	4	..	1(1)	..	..	..	7
Malaria	..	..	..	..	..	..	..	..	..
Meningococcal Infection	2(1)	2(1)	..	..	..	..	..	..	4
Ophthalmia	..	..	..	..	5	..	..	..	5
Ornithosis	1	..	..	..	..	..	..	..	1
Paratyphoid	..	..	..	..	1(1)	..	..	..	1
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	..	..	..	..	..	1	..	..	1
Puerperal Fever	..	..	..	..	..	..	..	..	..
Rubella	..	10(8)	..	2(1)	..	..	..	..	12
Salmonella Infection	..	..	..	1(1)	..	..	..	..	1
Scarlet Fever	7(3)	14(13)	1	1(1)	..	3	..	..	26
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	..	..	..	..	..	..	..	..
Trachoma	..	..	..	..	4	..	2	..	6
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	31(24)	18(17)	4(2)	8(6)	7(5)	3(1)	..	1	72
Typhoid Fever	..	..	2(1)	..	..	..	..	..	2
Typhus (Flea-, Mite- and Tick-borne)	..	..	..	..	..	..	..	..	..
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.

May 25: Meeting of The Royal Australasian College of Physicians. No seminar.

June 1: "Spastic Colon", Dr. B. P. Billington, Gastro-Enterology Clinic.

June 8: "The Mechanism and Treatment of Cardiogenic Shock", Dr. R. W. Gunton, Cardio-Vascular Unit, Toronto Hospital, Toronto.

June 15: "Recent Industrial Evils", Dr. G. C. Smith, Lecturer in Industrial Health, University of Sydney.

June 22: "Some Clinical Features of Thyroid Disorders", Dr. I. A. Brodziak, Royal North Shore Hospital of Sydney.

June 29: "The Cerebellum and its Disorders", Dr. J. W. Lance, Neurology Clinic.

These seminars will be held on Wednesday from 2 to 3 p.m. in the Maitland Lecture Theatre. They will be preceded by medical grand rounds at 12 noon and by a pathological demonstration ("Organ Recital") at 1.30 p.m.

ST. VINCENT'S HOSPITAL, SYDNEY.

Gastro-Enterology Unit.

THE next meeting of the Gastro-Enterology Unit will be held at St. Vincent's Hospital, Sydney, on Thursday, April 28, 1960, at 5.30 p.m. Professor C. R. B. Blackburn will speak on "Certain Aspects of Portal Hypertension and Œsophageal Varices". All medical practitioners are cordially invited to attend.

University Intelligence.

UNIVERSITY OF MELBOURNE.

DR. ROSS ANDERSON has been promoted to the position of Senior Lecturer in the Department of Physiology.

Dr. Mary Chennells has been appointed Lecturer in Physiology. She is at present Lecturer in Physiology at the Middlesex Hospital Medical School.

Corrigendum.

"DIABINESE" ADVERTISEMENT.

AN error occurs in the advertisement for "Diabinese" on page xl of THE MEDICAL JOURNAL OF AUSTRALIA ADVERTISER of April 9, 1960. In the first paragraph of the quotation in the centre of the advertisement "3·5 hours" should be "34·5" hours". Thus the paragraph should read: "Chlorpropamide (Diabinese) . . . is well tolerated when given by mouth . . . and its action is sufficiently prolonged to enable it to be given once a day, its half life being 34·5 hours. (Stowers et alii, 1959) . . . ".

We regret this error.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Rugless, Kenneth Robert, M.B., B.S., 1957 (Univ. Sydney), Boundary Street, Macksville, N.S.W.

Pallas, David Russell, M.B., B.Ch., 1954 (Univ. Wales), B.Sc., 1951 (Univ. Cardiff), The Surgery, Pemell Street, Toronto, N.S.W.

Johnson, Lindsay Albert, M.B., B.S., 1959 (Univ. Sydney), c.o. St. Luke's Hospital, Darlinghurst, N.S.W.

Deaths.

THE following death has been announced:

DECK.—George Henry Baring Deck, on April 4, 1960, at Wollstonecraft, N.S.W.

Diary for the Month.

APRIL 23.—Queensland Branch, B.M.A.: Fifth Branch Convocation.
APRIL 26.—New South Wales Branch, B.M.A.: Hospitals Committee.
APRIL 26.—Tasmanian Branch, B.M.A.: Southern Subdivision.
APRIL 27.—Victorian Branch, B.M.A.: Branch Council.
APRIL 28.—New South Wales Branch, B.M.A.: Branch Meeting.
APRIL 28.—Tasmanian Branch, B.M.A.: Northern Subdivision.
APRIL 28.—South Australian Branch, B.M.A.: Scientific Meeting.
MAY 3.—New South Wales Branch, B.M.A.: Organization and Science Committee.
MAY 4.—Western Australian Branch, B.M.A.: Branch Council.
MAY 5.—South Australian Branch, B.M.A.: Council Meeting.
MAY 10.—New South Wales Branch, B.M.A.: Executive and Finance Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All contract practice appointments in South Australia.

Editorial Notices.

ALL articles submitted for publication in this Journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations, other than those normally used by the Journal, and not to underline either words or phrases.

Authors of papers are asked to state for inclusion in the title their principal qualifications as well as their relevant appointment and/or the unit, hospital or department from which the paper comes.

References to articles and books should be carefully checked. In a reference to an article in a journal the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of article. In a reference to a book the following information should be given: surname of author, initials of author, year of publication, full title of book, publisher, place of publication, page number (where relevant). The abbreviations used for the titles of journals are those of the list known as "World Medical Periodicals" (published by the World Medical Association). If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors submitting illustrations are asked, if possible, to provide the originals (not photographic copies) of line drawings, graphs and diagrams, and prints from the original negatives of photomicrographs. Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary is stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2-3.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this Journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

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